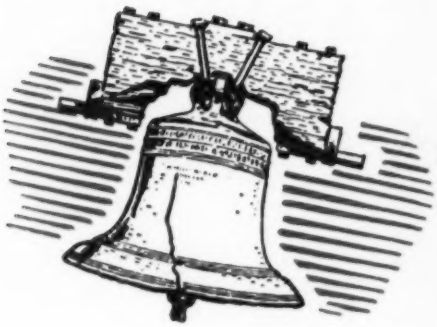
VOLUME 40
NUMBER 6

JUNE, 1953

Plating

AMERICAN ELECTROPLATERS' SOCIETY

PROGRAM



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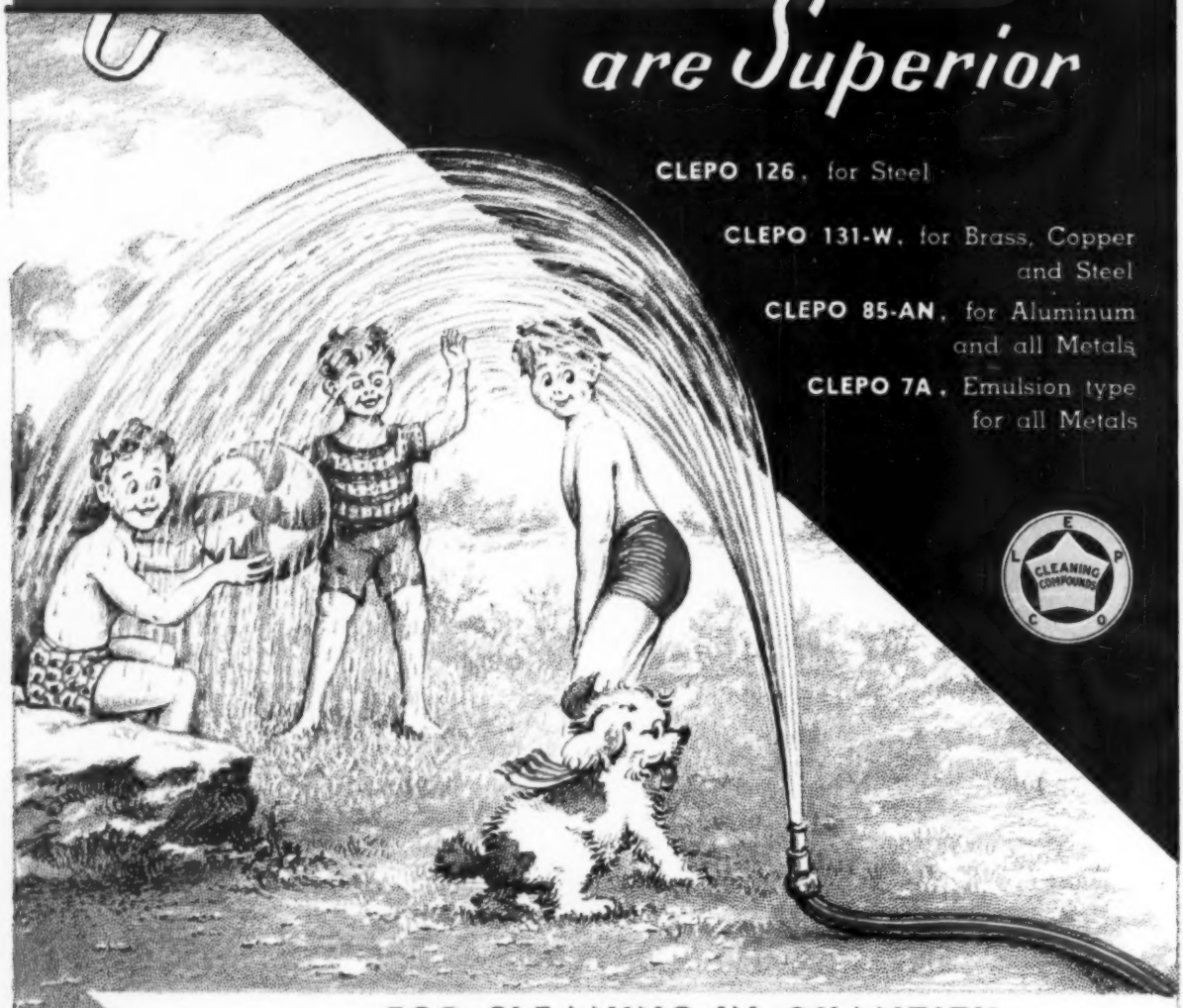

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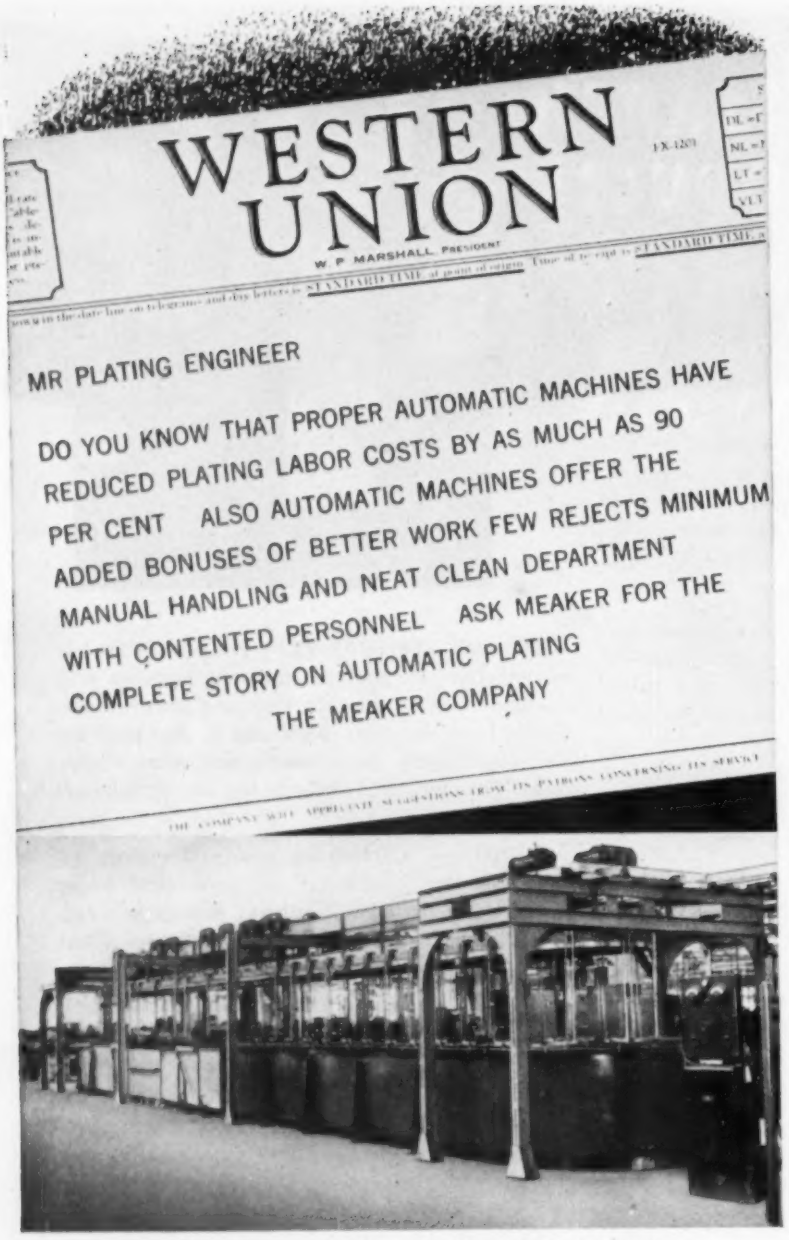
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In This Issue

Some Experiences in Plating on Nickel Silver by George Schore is a practical paper which details a series of practical and technical considerations that were followed in solving a difficult bright nickel plus chromium plating operation on nickel silver. Two cycles, the normal and revised procedure, that were used to overcome this job shop problem are outlined. A photo of the troublesome part is included.

Influence of Operating Variables on Composition of Electroplated Lead-Tin Alloys by A. H. DuRose and D. M. Hutchison is the concluding installment of the paper, part one of which appeared in the May issue. This section details data on the accuracy and precision of coulometric and gravimetric methods for the determination of the per cent tin in deposits.

Also included is an appendix which contains a step by step outline of analytical procedures.

Cleaning and Preparation of Metals for Electroplating VI. Sensitivity of Degreasing Evaluation Tests by Henry B. Linford and Edward B. Saubestre is the second and concluding installment of this most recent report from A. E. S. Research Project No. 12. This section of the report, part one of which appeared in the May issue, includes appendices and an extensive bibliography. Nine tables complete the paper.

40th Annual Convention, A. E. S., Condensed Program. The complete schedule of events for the Philadelphia Convention is reproduced from the Official Program. Included are the General Chairman's address of welcome to the conventioneers, abstracts of all the papers to be presented at the educational sessions, a detailed breakdown of all the special events and the official statements by the chairmen of the Ladies Committee, Branch Exhibits Committee and the Plant Visitations Committee.

For page numbers, see Table of Contents, page 625

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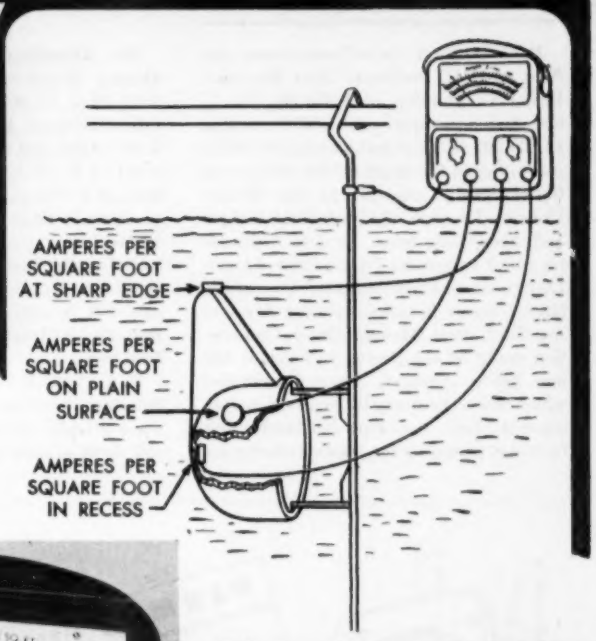
Measure Current Density at the Plating Surface

Now you can know *what goes on at the plating surface* to save time and money a dozen ways! Know where you are plating too fast or too slow — instantly read current density at different points with the article in every conceivable position, with various voltages and with different solutions—check throwing power of the solution instantly without analysis or figuring.

The BELKE-KOTZ Current Density Meter is a veritable watch-dog against plating room waste. Enables you to utilize all your experience and skill in plating to specifications, speeding production, saving time, saving metal, eliminating rejects, etc.



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Measures current density in amperes per square foot at desired points on the article under actual plating conditions.

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- No figuring. Meter is calibrated in amperes per square foot. You can compare the reading with current density tables for the solution you are using.

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Industry News

Bart Named Sub-Contractors for New A. E. C. Projects. Bart Manufacturing Corporation of Belleville, N. J., has been awarded contracts exceeding $1,500,000 as the sub-contractor to nickel plate pipe on the multi-million dollar contract recently awarded to the Walsh-Holyoke Division of Continental Copper and Steel Industries, Inc., to fabricate pipe and equipment for two new Atomic Energy Commission projects. One of the largest heavy industrial plating firms in the East, Bart Manufacturing Corporation designed the plating facilities at the new South Portland, Maine installation which was to be ready for production during mid-May. Steel pipe and fittings will be nickel plated on the inside diameter by the exclusive Bart nickel plating process which was developed by the company for the A. E. C. during World War II.

New Distribution Facilities for Enthone. Warehousing facilities in Cleveland, Ohio, for the metal finishing chemicals of Enthone, Inc., New Haven, Conn., were established recently by the appointment of R. O. Hull & Company, Cleveland, as exclusive distributors of Enthone products in Ohio, West Virginia, western Pennsylvania, part of western New York including the Buffalo area, and northeastern Kentucky. Sufficient stocks of chemicals will be maintained to enable shipments from Cleveland on an F.O.B. Cleveland basis.

R. O. Hull & Company has been distributing Enthone products for many years in Ohio. The recent change in policy will result in making products more available over a wider area and will extend Enthone service to this area since R. O. Hull & Company engineers will be assisted by an Enthone Service Engineer, Mr. Joseph E. Rhoads, who will make his headquarters at the Cleveland offices of R. O. Hull & Company.

Ardco, Inc., Chicago, Ill., have become exclusive distributors of Enthone products in western Michigan and Indiana in addition to their former territory of Illinois, Wisconsin, Iowa and Minnesota. Warehouse stocks are maintained by Ardco, Inc., in Chicago and Enthone service will be extended to this area by Robert Goodsell of Enthone, Inc., whose headquarters remain at the Ardco, Inc., Chicago offices.

Distribution of Enthone chemicals in Canada and warehousing of many of their products will be handled by Armalite Company, Ltd., Toronto, Canada. Active coverage of the provinces of Quebec and Ontario is accomplished by their sales engineering staff.

New Plant for Circo Cleaning Equipment. Topper Equipment Company has recently completed and moved into a new and modern manufacturing plant at Rahway, N. J. The 40,000 square foot new building was constructed especially for Topper's requirements in the manufacture of Circo metal cleaning equipment. It includes such special facilities as metallizing and blasting rooms, traveling craneways, extra-thick concrete floors for the type of equipment required. In addition to being located adjacent to the famous New Jersey Turnpike and the Garden State Parkway, this new plant is located on the Lehigh Valley Railroad.

Schaffner Expansion Continues. Schaffner Manufacturing Company, Inc., Pittsburgh 2, Pa., have announced breaking ground for a 6,250 square foot new addition to their plant in Emsworth, Pa. This will be the fourth consecutive year that company growth has required expansion of plant facilities.

Film on Continuous Casting. A new, full-color, 35 mm. sound-slide film, describing the patented ASARCO process for continuous casting of bronze rod, tubes and shapes, has been completed by the Continuous-Cast Products Department, American Smelting and Refining Company, Barber, N. J. It is available

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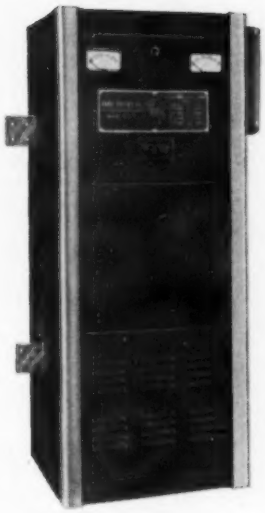

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to interested groups without obligation. Technical societies, professional clubs, schools, engineering staffs, or other groups interested in this instructive film can call or write the Continuous-Cast Products Department, American Smelting and Refining Company, Barber, N. J. Where possible a lecturer will be provided; the film is available free.

Name Change. Diamond Alkali Company announced that the name of its subsidiary, Kolker Chemical Works, Inc., a New Jersey Corporation, has been changed to Diamond Alkali Organic Chemicals Division, Inc. Diamond purchased the Kolker concern in August of 1951 as part of its expansion program in the organic chemicals field. The subsidiary has plants at Newark, N. J., and Houston, Tex., which manufacture a wide range of organic chemicals for agriculture and industry.

Courses of Instruction on Plastic Materials of Construction. Atlas Mineral Products Company, Mertztown, Pa., has established courses of instruction on plastic materials of construction. The subject matter will be based primarily on a reference book authored by Drs. Raymond B. Seymour, Robert H. Steiner and George Gabriel. This will be supplemented by practical applications. A full week's course and a three-day course have been established for corrosion engineers and maintenance personnel respectively.

No tuition will be charged but each applicant accepted will be expected to defray his own expense for transportation and living costs during the training period. Attendance will be limited to male industrial engineers and maintenance personnel who require a knowledge of corrosion resistant coatings, linings, jointing materials, fabricated plastics and caulking materials in their work. Those interested in attending these courses should write to Joseph A. Snook, Vice-President, Atlas Mineral Products Company, Mertztown, Pa.

Nankervis Expands Operations. The George L. Nankervis Company, manufacturers of metal finishing equipment for the automotive and aircraft industries, announces the completion of its third expansion program in the past three years. The latest expansion includes a new manufacturing plant and additional engineering facilities.

Located adjacent to the main facilities, the new one-story plant provides over 10,000 square feet of manufacturing space. The new building was designed to facilitate the rapid fabrication of metal finishing equipment, such as plating tanks, racks, etc. It is equipped with two 10,000 pound bridge cranes which cover the entire working area. New equipment in use at the plant include: arc, heliarc and acetylene welding equipment, iron workers, nibblers, brakes, shears, punch and hydraulic presses and allied equipment.

Engineering facilities have been increased by the equipping of an additional 3,000 square feet of engineering space in a new building near the main plant. Engineering capacity has been doubled, both in area and personnel, to meet the increased volume handled by the company.

Micro Finishes Applied to Metal Surfaces. Stainless steel, aluminum, monel, inconel, carbon steel, and other metal on metal alloy plates, sheets, and coils can be finished to within micro inch specifications and in a wide variety of surfaces not available from regular mill sources. This, according to information made available by the Apollo Metal Works, 66th Place, Chicago, Ill., answers

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Industry News

designers' and manufacturers' long standing need for a versatile range of metal finishes available on an economical production basis. The scope of application includes home and commercial appliances —cabinet trim, sink and range tops, packing house and food processing equipment— instrument panels, display signs, functional accessories and many others.

Beckman Field Engineers

Beckman Assigns Posts for New Field Engineers. With the assignment of 20 new field engineers to district offices throughout the U. S. and Canada, Beckman Instruments, Inc., has ended one of the most intensive employee training programs in the precision instrument industry. The graduates represent a three-fold expansion of the company's national field staff. They will provide a direct factory contact for users and distributors of Beckman scientific and industrial control equipment.

Originally screened on the basis of scholastic achievement and practical experience, the graduate engineers successfully completed nearly 500 hours of study in the operation, performance and field maintenance of Beckman spectrophotometers, *p*H meters and related instruments.

Lectures on applications of electronic control and analytical equipment were delivered by prominent specialists from the food, metals, paper and petroleum industries.

New Process for Trichlorethylene. The Detrex Corporation of Detroit, Mich., has announced a new, highly efficient process which results in the simultaneous production of both an important industrial solvent and a basic raw material used in the manufacture of a wide variety of chemicals and plastics. The new process was developed for the manufacture of trichlorethylene, and also results in the simultaneous manufacture of hydrogen chloride as a pure gas. Detrex, which originally developed the stabilizing process which made trichlorethylene commercially practical, currently is the world's largest supplier of the chemical direct to consumers.

The new process will be installed in the Ashtabula, Ohio plant, and conversion is expected to be completed by April, 1954. There will be no interruption in the production of trichlorethylene at the time of the changeover to the new process.

Technic Inc. Acquires A. Robinson & Son. Manufacture and sale of all precious metal plating solutions formerly made and sold by A. Robinson & Son of New York have been taken over by Tech-

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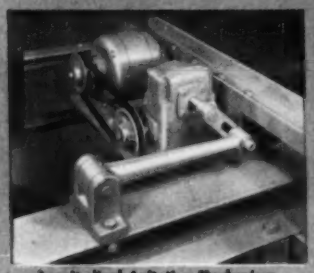
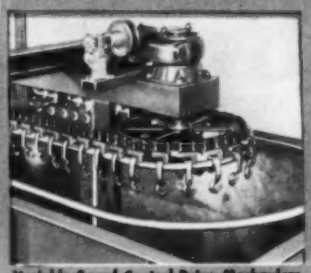
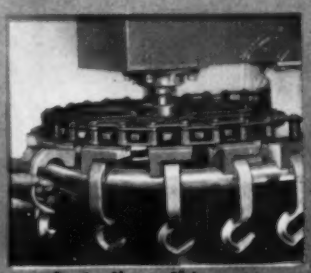


Longitudinal Agitating Mechanism

DOUBLES PLATING PRODUCTION



Variable Speed Control-Drive Mechanism



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Here's a new high in plating versatility, simplicity and economy of operation: A progressive plating plant replaced their still tanks with our standard semi-automatic package system; with *no increase in labor* they immediately increased production over 100% and *improved* quality. When the current long run is completed, the system will be altered for the next job by simply shifting to the desired spacing of the shoes (any dimension in 2" increments.)

There's no maintenance problem with this Wagner Semi. All wear points are Zerk lubricated; the Link-Belt roller chain is obtainable almost everywhere; the Micarta pusher blocks last indefinitely; variable speed control and drive mechanism are a unit, replaceable in minutes; the ball-bearing motor is totally enclosed, protected from drip, corrosion and moisture. The lateral agitating mechanism is mounted at one end on a single bracket and the tank is clear for loading at any point, all around. For uninterrupted plating and uniform quality, the 1⅜" anode bar radius is equidistant from the cathode at ends. The heavy sprocket shaft turns on three bearings, one outboard and two in speed reducer, for long life.

BEST OF ALL, the new Wagner Semi-Automatic comes ready for installation, completely bussed, ready to go. The price is so interesting you can figure right now to work it in with your present still tank operation or replace entirely, with economy and versatility for diversified parts plating work. Drop us a line or send the coupon for complete information and name of our representative near you.

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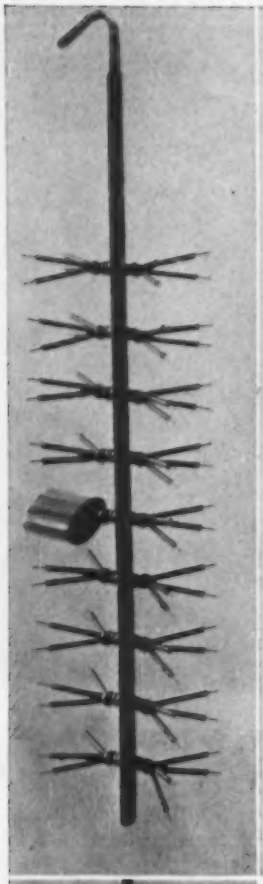

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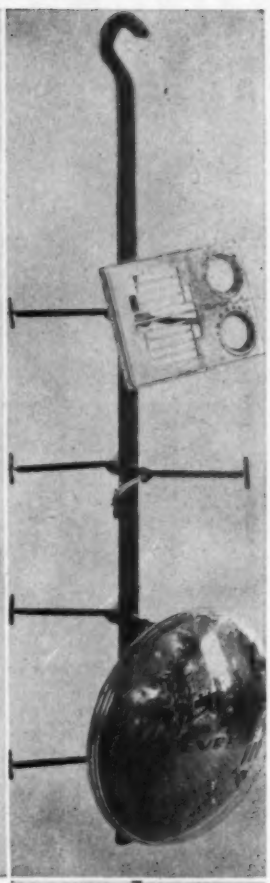

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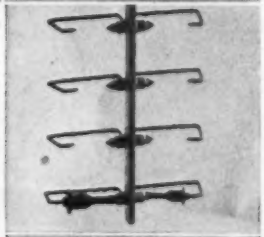

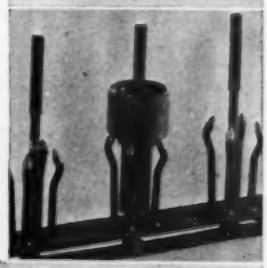

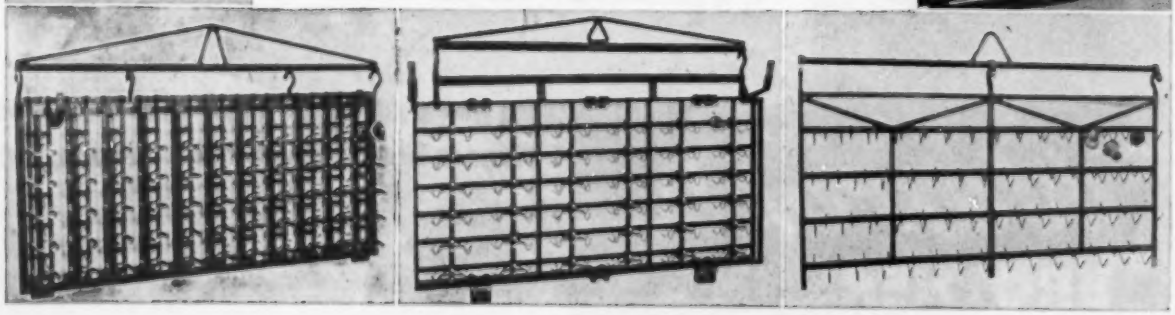

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- Baths are easy to make up from prepared salts . . . economical to maintain.
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Electrochemicals Dept., Wilmington 98, Del.

Please send me complete information on Du Pont Plating Chemicals—properties, advantages and recommended procedures. I am interested in the following types of plating:

☐ Zinc Plating ☐ Tin Plating
☐ Copper Plating ☐ Cadmium Plating

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*City*_____ *State*_____

Industry News

nic Inc. of Providence, R. I. The change-over will result in no interruption in service to former customers of A. Robinson & Son. Already one of the largest enterprises of its kind in the world, Technic Inc. has rounded out its line by the recent acquisition.

Technic Inc. will adapt Robinson's solutions and salts to the automatic control methods of precious metal plating which result in accurate and automatic control of the thickness, color, brightness and hardness of the deposits.

Kanigen Nickel Plating Process. General American Transportation Corporation, 135-P, S. La Salle St., Chicago 90, Ill., announces the availability of a new nickel plating process. The new process, which requires no electrolytic equipment, has been named "Kanigen". It promises remarkable economies in many industrial applications over customary methods, and in addition makes it possible to plate almost any solid substance with a dependable and predictable thickness of a superior, non-porous plate. The process, it is claimed, will plate any article uniformly, regardless of size or shape, and has proved satisfactory for the production-line plating of steel, copper, brass, bronze, stainless steel and aluminum. Tests on plastics and magnesium indicate that these materials will prove practical for "Kanigen" plating. It is estimated that equivalent plate protection can be achieved with the new process with ⅛ to ½ the nickel required by other processes, partially because of "Kanigen's" non-porosity, partially because it plates so uniformly that it is unnecessary to overplate in places to assure ample overall plating.

Rubber Vulcanizing Service. The MW Protective Coatings Division of Metalweld, Inc., has installed in their new Scotts Lane Plant, one of the largest rubber vulcanizers in the Philadelphia area, for the joining of hard and soft rubber sheets to steel. This vulcanizer will accommodate tank lining jobs up to 12 feet in diameter by 26 feet long.

Bridgeport Brass Opens Warehouse at Providence, R. I. The Bridgeport Brass Company is moving their New England warehouse facilities at Providence to a new and larger location at 177 Georgia Ave. in that city. The new warehouse will be headed by N. Newbury, District Sales Manager, and will provide more space for carrying larger stocks which will enable the company to give prompt service on copper and brass requirements throughout New England.

New Sales Office for Norton. The New York City domestic sales offices of the Abrasive Division, Grinding Machine Division, and Refractories Division of Norton Company, Worcester, Mass., formerly of 61 Broadway, have moved to Green and North Sts., Teterboro, N. J.

The new headquarters at the Behr-Manning (a Norton Company affiliate) warehouse and office at Teterboro have been established to improve service to customers in the New York industrial area. The office of Norton Behr-Manning Overseas, Inc., will remain at 61 Broadway, New York 6, N. Y.

Permutit Moves West Coast Sales Office. The Permutit Company, New York 36, N. Y., announces the removal of its Los Angeles, Calif., sales office to a new location at 302-B S. Brand Blvd., Glendale 4, Calif. George A. Swem will continue in the capacity of Industrial Sales Engineer while Household Sales will continue under the direction of J. H. Mosher, Pacific Coast Regional Manager.

Dr. Weisberg at New Location. Dr. Louis Weisberg, Chemical Engineer and Electroplating Consultant, has announced the removal of his offices to a new location at 10 E. 39th St., New York 16, N. Y.

Question!
How to Solve Your Thickness Problems?
Answer!
With the New KOCOUR Electronic Thickness Tester!
DETERMINES THE THICKNESS OF METALLIC COATINGS BETTER! . . . FASTER! . . . EASIER! . . . CHEAPER!
The new KOCOUR ELECTRONIC THICKNESS TESTER is the answer to your thickness problems . . . QUICKLY and almost AUTOMATICALLY . . . this highly accurate instrument can determine the thickness of all the commonly plated metals on various base metals . . . thus putting an end to costly rejects and reworking.
KOCOUR'S NEW ELECTRONIC THICKNESS TESTER HAS THESE OUTSTANDING FEATURES:
● Set is self-contained.
● 90-95% accurate depending upon type and thickness of the plate.
● Average test requires only about 1 minute.
● Minimum thickness determined is 500,000's of an inch (5,000,000 for chromium).
● Maximum thickness determined is indefinite.
● Operates virtually automatically.
● Reads directly . . . no calculations necessary.
● Relatively insensitive to surface roughness.
● Compactly housed in portable metal cabinet, 17"x16"x19".
● Operates from 105-125 volt, 60 cycle, A.C. electric outlet.
Write today for full information . . . no cost or obligation.
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Specify KOCOUR TEST SETS from Your Supplier! Pioneers and Specialists in Testing Equipment Since 1924.
P.S. Whether your set-up calls for small or large volume work . . . there's a specialized KOCOUR SET for your requirements . . . developed to do a faster, better, more economical job.

FOREMAN PLATER

experience with brass, copper, bright nickel, chromium (including hard and porous), cadmium, zinc coatings, anodizing and organic finishing. Knowledge of analytical and administrative control. Now employed in West desires to return to Newark-New York Area.

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Davies plating racks are industry designed to fit specific needs . . . more than 2000 designs are in use. They're Miccrosol coated to resist all solutions.

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TOPPER EQUIPMENT COMPANY ("Circo Degreasers")
FREDERIC B. STEVENS, INC.
ALROSE CHEMICAL COMPANY (Jetal Process)
ALLIED RESEARCH PRODUCTS (Iridite)
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New England Lead Burning Company
New Holland Machine Company
Storts Welding Co.
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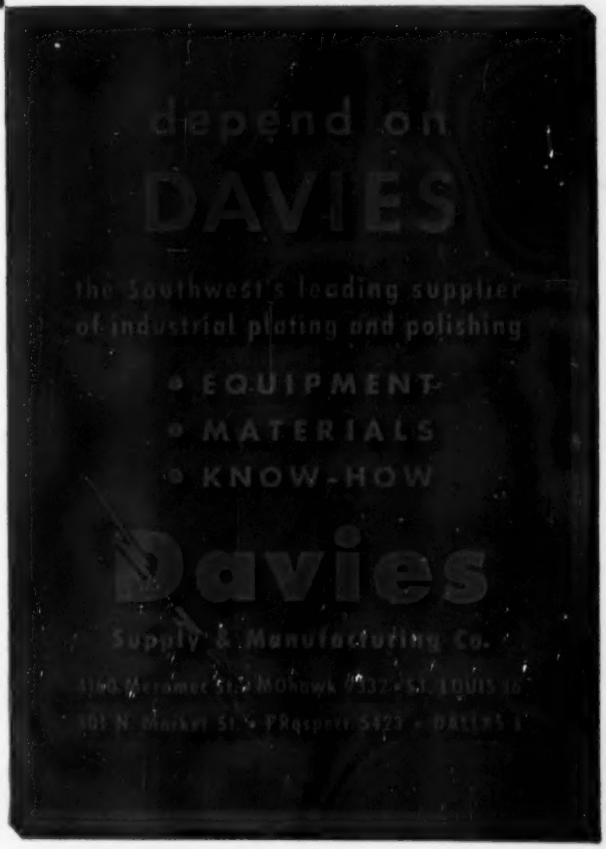
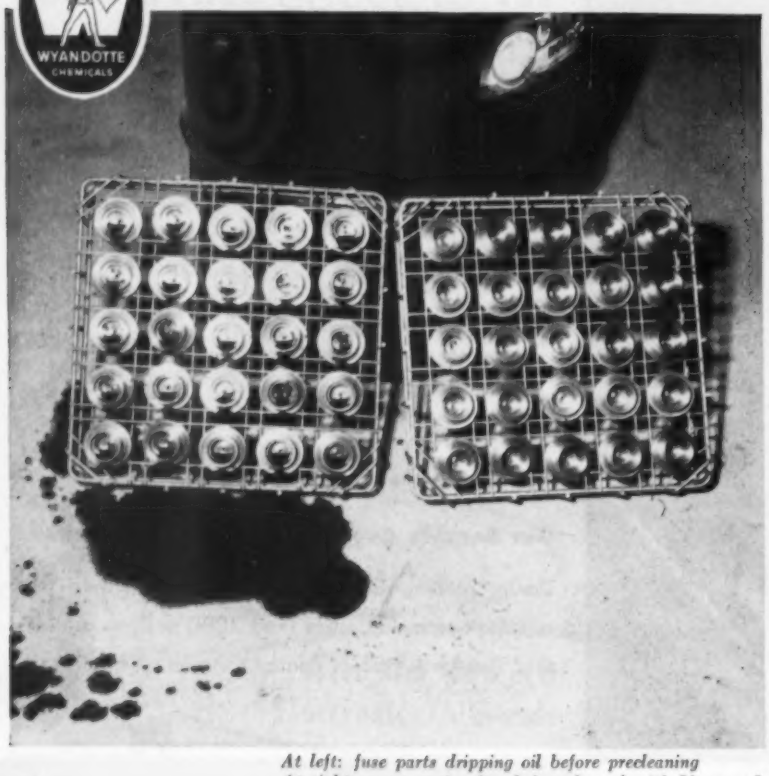
Write us for complete information



Specialists in Industrial Cleaning Products



At left: fuse parts dripping oil before precleaning
At right: same parts after being cleaned with NORDALL*

How Wyandotte Nordall solved another tough cleaning problem

The Problem:
Steel fuse parts at the Supreme Knitting Machine Co., Inc., of Ozone Park, L.I., New York, weren't getting proper precleaning and rust protection prior to inspection and transfer to a cadmium-plating line. The result—high and costly rejects!

The Solution:
At their Wyandotte representative's suggestion, they switched to WYANDOTTE NORDALL . . . a liquid metal cleaner with excellent detergency and rust-inhibiting properties. NORDALL is designed for emulsion pressure spray washing as well as solvent immersion cleaning. There are no "sudden death" problems with NORDALL, for even in spray washers with water at high temperatures evaporation loss is very low. This, of course, means lower consumption and **reduced costs** in addition to dependable performance!

The Result:
After being cleaned with NORDALL, these same steel parts were in excellent condition for inspection, and for electrocleaning prior to plating—and they did not rust! Immediately, rejects were cut way down. Supreme told the Wyandotte man, "Don't let us run out of NORDALL!"

NORDALL, or other products in Wyandotte's full line of metal cleaners, may help solve *your* metal-cleaning problems. Ask your Wyandotte representative, or write for free information. *Wyandotte Chemicals Corporation, Wyandotte, Mich.; also Los Angeles 12, California.*

CLEANING THE WORLD

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Largest manufacturers of specialized cleaning products for business and industry

Wyandotte CHEMICALS

Helpful service representatives in 138 cities in the U. S. and Canada

Society News

A.S.T.M. Committee B-8 on Electrodeposited Metallic Coatings

Committee B-8 met in Detroit, Mich., during A. S. T. M. Committee Week. Subcommittee II on Performance Tests will make available as an appendix to the B-8 report, data on the copper-nickel-chromium and lead deposits over steel. These tests have been on exposure for some 8½ years, as of the 1952 inspection, and sufficient data have now been accumulated so that it may be possible to draw some definite conclusions. A method for rating panels has been developed by this subcommittee and is currently out to letter ballot of the main committee.

The Subcommittee on Electroplating Practice is continuing its activity with the submittal to the Society in June of a recommended practice for preparation of and plating on copper alloys. In view of the lack of interest, the section on plating of plastics has been dissolved but the two remaining sections, one on plating on lead and one on malleable and cast iron are making steady progress and recommended practices for these two materials should be available within the next year. It was voted, subject to letter ballot, to advance other recommended plating practices to standard. These include recommended practices for B242 (high carbon steel), B252 (zinc), B253 (aluminum), and B254 (stainless steel).

New work of the committee includes the establishment of a section to develop a recommended practice for alkaline cleaning.

An entirely new field of work to be undertaken by the committee will cover the field of tin plating. This investigation will include a performance test of tin coatings on steel and copper as well as the behavior of tin-zinc, tin-lead, tin-cadmium, tin-copper, and tin-nickel coatings. One of the big unanswered problems is that of methods of testing and anticipating the solderability of tin coatings.

A. S. T. M.'s 56th Annual Meeting

Eight technical symposiums and many other technical papers on a wide range of subjects in the field of engineering materials are on the program of the 56th Annual Meeting of the American Society for Testing Materials at Chalfonte-Haddon Hall, Atlantic City, N. J., June 28 to July 3, inclusive.

An important feature of the program also will be the 27th Edgar Marburg Lecture (Wednesday afternoon, July 1) to be given by Frederick D. Rossini, international authority in the field of physical chemistry, and Head of the Department of Chemistry at the Carnegie Institute of Technology.

PRECIOUS METAL SALTS & SOLUTIONS

As specialists in the precious metals, we have both the facilities and the trained personnel best able to produce salts and solutions for the plater. As a result, ours enjoy a well earned reputation for high quality and consistent performance.

RHODIUM PLATING SOLUTION — It was in our plant that the answer to the problem of rhodium plating on a commercial scale was found. Our solution is made under the direct supervision of the men responsible for this development.

PLATINUM PLATING SOLUTION — We have developed platinum plating to a point where it stands upon a truly scientific basis. Both flash and heavy deposits are made from the same solution.

PALLADIUM PLATING SOLUTION — Produces a flash plate in from 15 to 60 seconds. Heavy deposits can be made from the same solution. Gives excellent results in plating connectors, wave-guides and other electronic equipment.

CONCENTRATED GOLD PLATING SOLUTION No. 319 — Containing one ounce of fine gold.

CONCENTRATED REPLENISHING SOLUTION No. 320 — Containing one ounce of fine gold.

CONCENTRATED UNDERPLATE OR STRIKE No. 321S — Containing one-half ounce of fine gold.

GOLD COLORING SOLUTIONS — For light, yellow, red and green gold.

HIGH GOLD CYANIDES — Our sodium-gold cyanide contains 71.5 per cent of fine gold and our potassium-gold cyanide 67 per cent as compared with commercial salts of 46 and 41 per cent. Gold content for gold content, our high gold cyanides cost you no more. We make the commercial 46 and 41 per cent salts too.

SILVER SALTS—SILVER ANODES — We make silver cyanide and silver nitrate as well as silver anodes.

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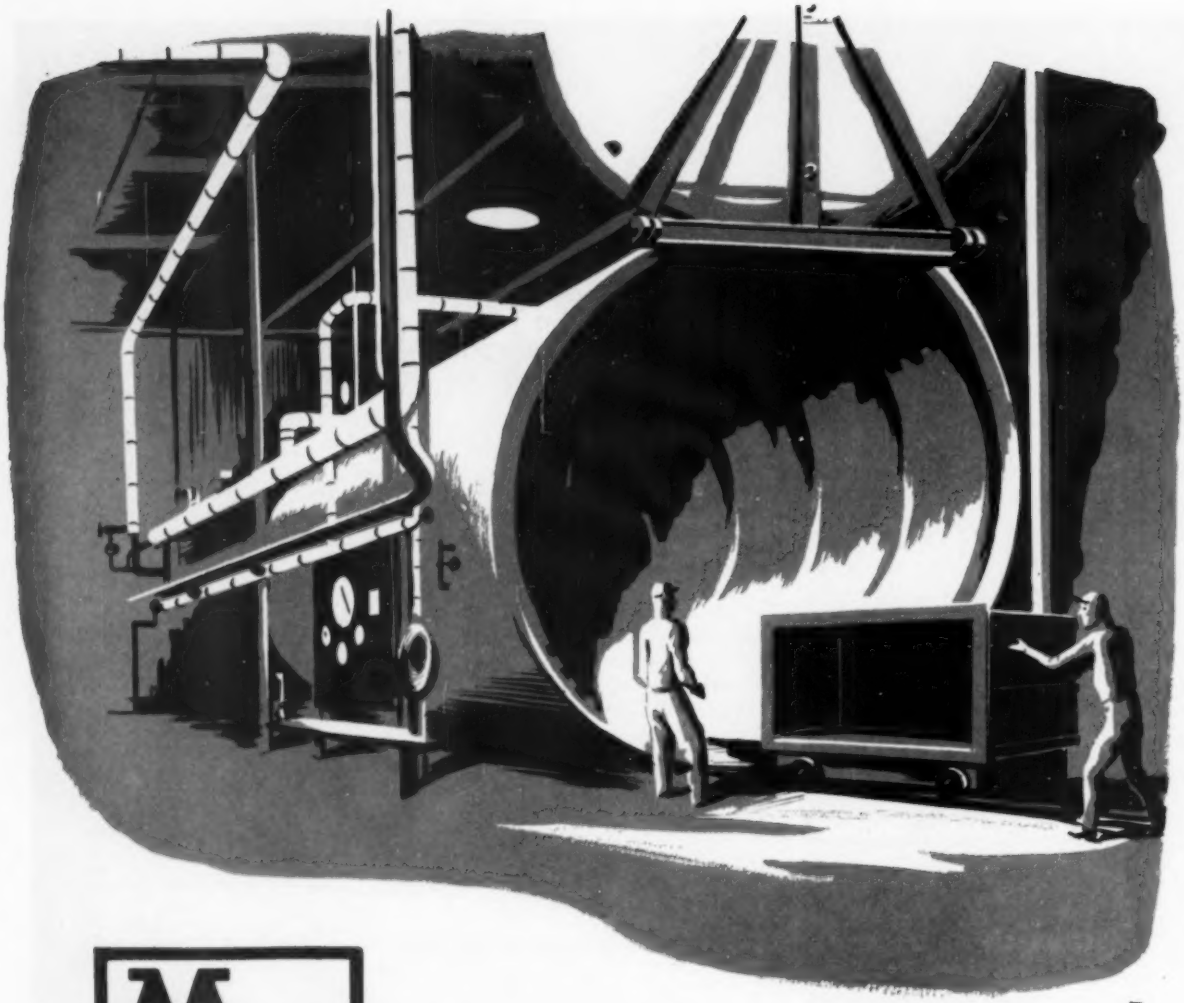

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against acids, corrosives and abrasives
makes MW
your logical choice
whatever your corrosion problem.
Our new Scotts Lane Plant
features the most modern vulcanizing equipment
for bonding rubber to metal.

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a new,
radically different
easy-to-apply
corrosion resistant finish
for magnesium...

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#15

(MAG-COAT)

another famous
IRIDITE
finish from

ALLIED RESEARCH PRODUCTS
INCORPORATED
4004-06 E. MONUMENT STREET • BALTIMORE 5, MD.

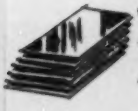
WHAT IS IRIDITE #15?

Iridite #15 is a corrosion resistant surface treatment for wrought, cast or extruded magnesium. It can be used either as a final finish or as a base for paint. Chemically, Iridite #15 is known as a chromate conversion coating. That is, it converts the bare magnesium surface to an entirely new and chemically different surface. This new surface is best described as a complex chromium-chromate.

WHAT DOES IRIDITE #15 LOOK LIKE?

The finish is a pleasing dark brown color. However, elevated drying temperatures produce still darker colors, approaching a black. Elevated drying temperatures do not measurably affect corrosion protection. The coating is actually an integral part of the metal itself, thus cannot flake, chip or peel when the surface is bent.

WHO CAN USE IRIDITE #15?



Producers or fabricators of magnesium in wrought, cast or extruded form can use Iridite #15. Mill producers will find Iridite #15 practical and economical to apply and high in protective quality. Fabricators will find the same ease and low cost of application . . . plus the extra advantage of a more attractive, more serviceable product from using Iridite #15. It will meet present standards for protective treatments of magnesium parts.

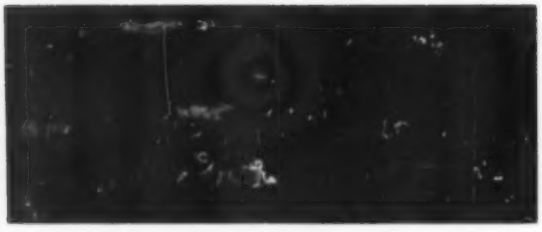
HOW GOOD IS IRIDITE #15?
here's the answer...

Just look at these unretouched photos of sample panels treated with IRIDITE #15 and an MIL-M-3171 Type III magnesium finish.

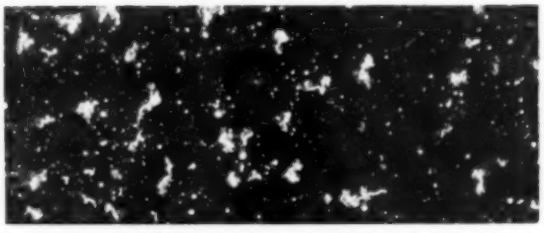
Dow FS-1 alloy panels as treated

IRIDITE #15

MIL-M-3171 TYPE III



after 72 hour salt spray



IRIDITE #15

weight loss in corrosion products 0.40 milligrams per square centimeter.

MIL-M-3171 TYPE III

weight loss in corrosion products 2.20 milligrams per square centimeter.

You be the judge!

Iridite #15 is sold for use without license. Got some more questions? To get the answers . . . quick . . . call or write your nearest Iridite Sales Engineer. He's listed under "Plating Supplies" in your classified phone book. Or, write us direct.

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Manufacturers and marketers of Iridite Finishes for Corrosion Protection and Paint Systems on Non-Ferrous Metals; ARP Plating Chemicals
West Coast Licensee: L. H. BUTCHER COMPANY

Personals

L. K. Lindahl, in a move made necessary by a recent expansion program, has relinquished his duties as president to devote full time as chairman of the board, and **Clyde H. Reeme** has assumed the presidency of the Udylite Corporation.

Lindahl

Reeme

Nagle

Barak

In other shifts, **Lawrence V. Nagle** was named executive vice-president and **Arthur L. Barak** as treasurer.

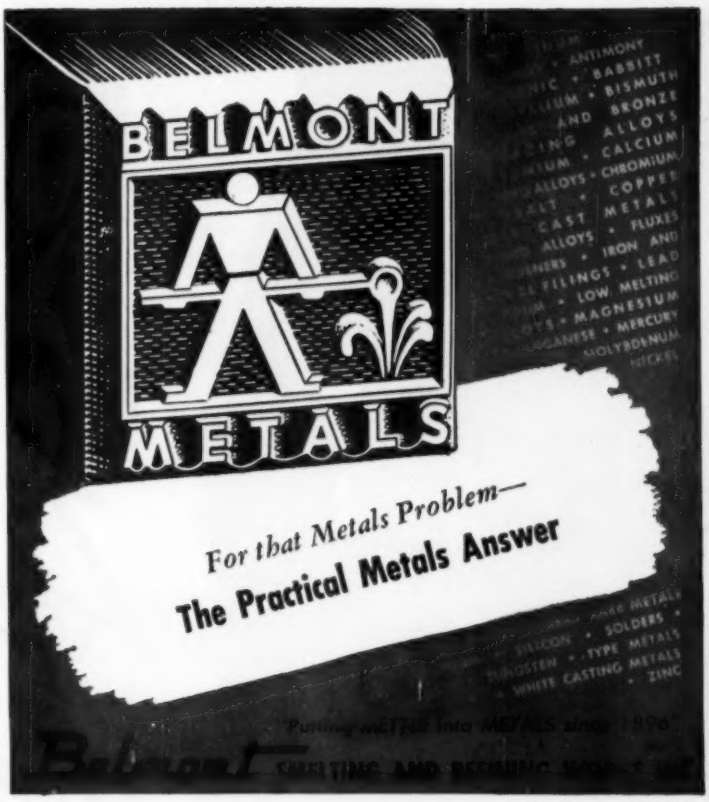
Reeme, born in Tiffin, Ohio, has been with Udylite since 1927 when he joined the firm as auditor. He was named assistant treasurer in 1929. He became vice-president and treasurer in 1938 and has served in that capacity up to his recent appointment.

Nagle formerly was vice-president aad general sales manager. He has been with Udylite since 1927, coming from the United Autographic Register Company.

Barak, a native of Boston, Mass., joined Udylite Corporation in 1935. He succeeded Reeme as assistant treasurer in 1938. Barak was with Federal Motor Truck Company before his association with Udylite.

K. E. Blessing has been promoted to the post of district manager of the American Wheelabrator & Equipment Corporation's sales office at Hoboken, N. J. Also named to that office as sales engineer was **F. John Pichard.**

Blessing, a Purdue engineering graduate, has been with the company over 5 years. Pichard is an engineering graduate of Stevens Institute of Technology and



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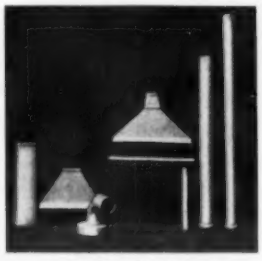
HERE'S THE ECONOMICAL ANSWER TO YOUR ACID-PROOF HOOD and DUCT REQUIREMENTS



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Put RIGIDON Solid Plastic Hoods and Ducts to Work in Your Plant For Longer Service Life

- **Acid Protection Inside and Out.** No need to be concerned about lining failure.
- **Easy to Install.** Although strong as light gage steel, these ducts are light in weight and easy to install.
- **Good Chemical Resistance.** Will resist practically all chemical conditions and high temperatures.
- **Round or Rectangular.** Easy to replace present system.
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WRITE TODAY for Illustrated Bulletins No. 752, 753 and 754 on Solid Plastics.

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Don't Cost -they Pay

More and more metal finishing companies are switching to EXOLON Abrasives. They know that using inferior materials costs more in the long run than EXOLON. It cuts rapidly, uniformly and has excellent resistance to breakdown. EXOLON effects substantial economies in finishing time and abrasive material. Less time is required to surface a given area.

Careful grading, shaping and removal of magnetic elements gives you top efficiency for polishing all kinds of tough metals, including spring steel, sheet metal, cold rolled stock, forgings and stainless steel.

Ceramic coating of BST assures strong adhesion to the set-up wheel. Write today for complete information on EXOLON Abrasives!

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973 East Niagara St. Tonawanda, New York

MANUFACTURERS OF SILICON CARBIDE AND ALUMINUM OXIDE ABRASIVES

Personals

was with Westinghouse Electric Corporation and the Foxboro Company.

Earl W. Couch has been elected President and Treasurer of The Lea Manufacturing Company, Waterbury, Conn., to succeed Robert S. Leather who was named Chairman of the Board.

Couch

Gay

Other officers elected were: Vice-President, **Richard P. Crane**; Secretary, **Henry L. Kellner**; Assistant Treasurer, **William D. Starr**; Assistant Secretary, **Ellsworth T. Candee.**

At a meeting of Lea Manufacturing Company stockholders, **Roger E. Gay**, President of the Bristol Brass Corporation, Bristol, Conn., was elected to the Board of Directors. He fills the vacancy created by the death of Louis M. Fuller, who was President of The American Abrasive Company, Westfield, Mass.

Durando Miller, Jr., has been promoted to the position of Assistant Technical Manager of Permutit Company, New York, N. Y., reporting directly to **H. L. Beohner**, Vice-President. Miller joined

Miller

Permutit in 1938 as a member of the sales estimating department and was transferred in 1941 to the technical department, serving there until his new appointment.

He graduated from the Yale School of Engineering, receiving a Bachelor's degree in Civil Engineering in 1938. While at Yale, he was elected to the Tau Beta Pi and Sigma Xi. He has written a number of papers on the various aspects of Sanitary Engineering and served for three years as an instructor of Industrial Water Treatment to classes in Sanitary Engineering at the Graduate School of Engineering, New York University.

Roger E. Bremer has been named director of purchasing at Packard Motor Car Company. **Oliver E. Rodgers** was appointed chief engineer of the Company's Jet Engine division

Bremer, 37, joins Packard after serving as purchasing agent for Lincoln-Mercury.

Rodgers, 37, comes to Packard from Philadelphia where he was assistant manager of the gas turbine division for Westinghouse Electric Corporation. A graduate of Harvard, he is one of the early pioneers in gas turbine engineering.

Commander H. J. Huester, member of the Baltimore-Washington Branch, A. E. S., has been transferred from the Aviation Supply Office (TDO) at Philadelphia to the Overhaul and Repair Department of the Naval Air Station at Jacksonville, Fla.

Frank Passal, a member of the research staff of United Chromium, Incorporated, since 1934, has been promoted to Assistant

Passal

Director of Research, Plating Division. Passal has contributed greatly to the

Here's a unique type of batch cleaning machine for all kinds of metal parts that enables you to fit the cleaning operation right into your production line. The cleaning job is so speeded up by the "up and down" motion of the work in the machine that in most cases the flow of parts through the machine is practically continuous from a production line viewpoint.

No Motors... No Gears... No Sprays

This Magnus Aja-Lif Cleaning Machine has NO motors... NO gears... NO sprays. It is powered by compressed air. Its compactness makes it easy to fit into limited floor space, and as there are no overhead conveyors or hoists, there is no head-room difficulty.

The Magnus Aja-Lif Cleaning Machine is fast and uniquely thorough in its cleaning action because the work itself moves up and down in the cleaning solution many times a minute, providing a mechanical "shearing" action on the dirt and chips, plus constantly agitated cleaning solution that works faster and better because of it.

Minimum Labor Costs

The Aja-Lif Machine loads and unloads at the top, at waist level. One lever lowers the load, starts the machine, cuts it off and raises the load at the end of the brief cleaning period. It's a one man job, with no supervision required during cleaning.

WRITE FOR BULLETIN 703-AL

magnus

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41 South Avenue, Garwood, N. J.
In Canada—Magnus Chemicals, Ltd., Montreal
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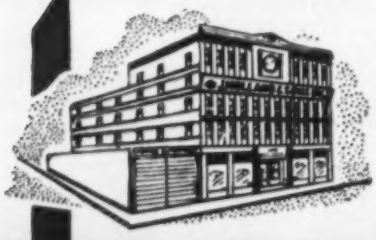

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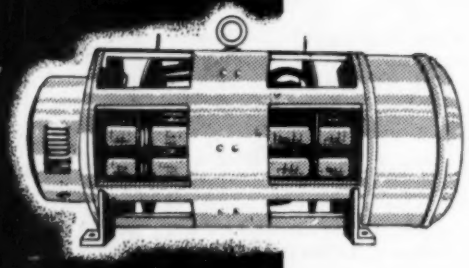
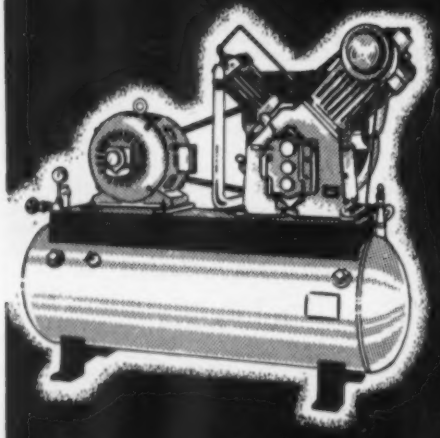
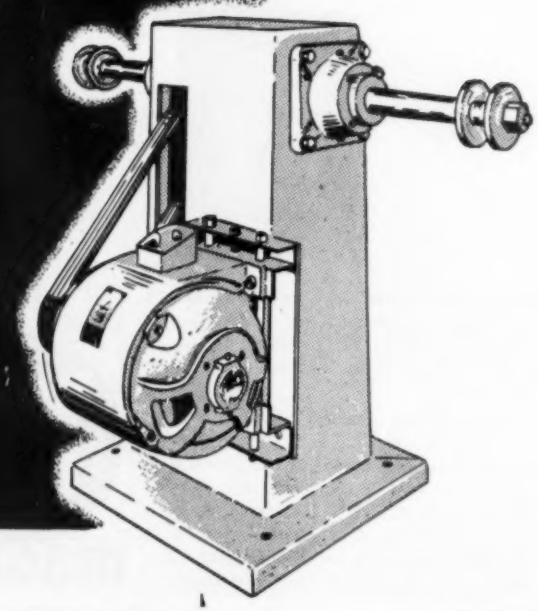
ELECTROPLATING AND FINISHING EQUIPMENT AND SUPPLIES

Motor Generator Sets, Plating Rheostats, Tanks for all purposes, Plating Barrels, Agitators, and practically everything for the Plating Department.





Air Compressor Units, Baking Ovens, Spray Booths, Fans, Transformers, Regulators, Pressure Tanks, and practically everything for the Spray Department.



Motor Driven Buffing Lathes, Hoods, Blowers, Ducts, Blower Systems, Floor Lathes, Scratch Brush Units and practically everything for the Buffing Department.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 622.

guess work won't go on...

CYANIDE WASTE TREATMENT

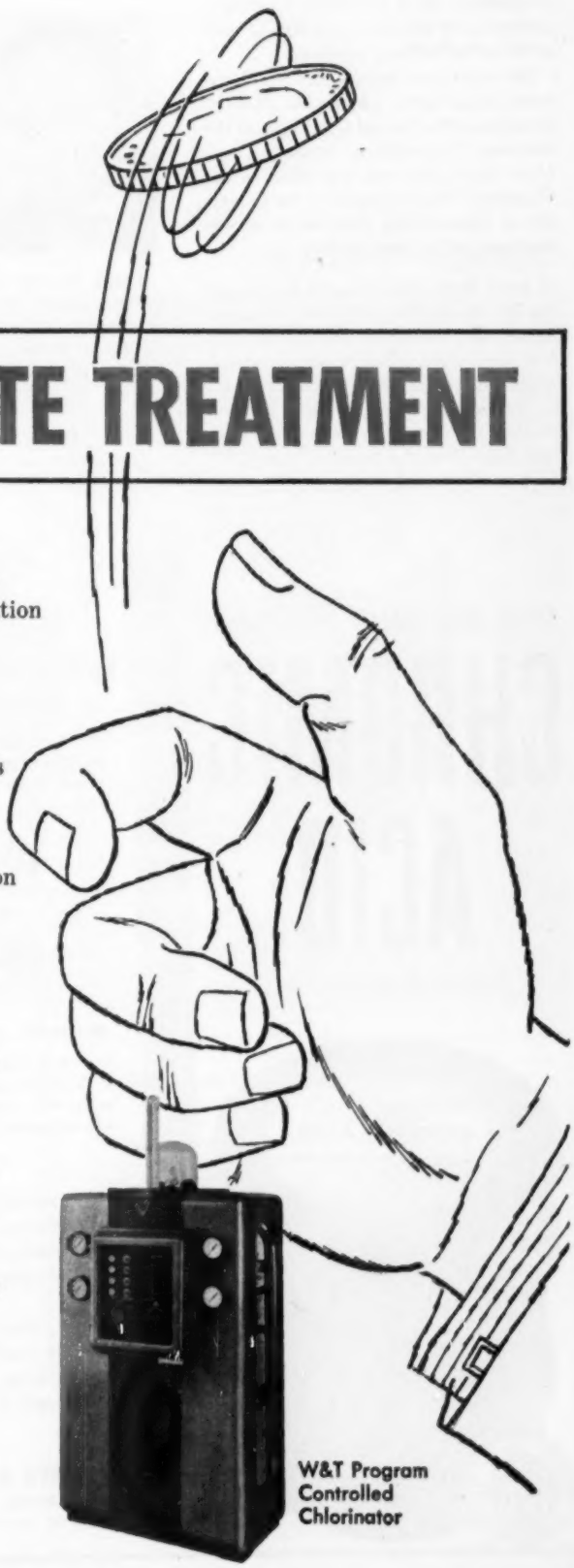
Experience, not guess work, is the basis for the success of Wallace & Tiernan's alkaline chlorination installations for cyanide waste treatment.

CHLORINATION KNOW-HOW

Alkaline chlorination — now accepted as standard cyanide waste treatment practice in the metal finishing industry — oxidizes cyanides by chlorination at controlled pH values. It is effective and economical when properly applied. Since no two cyanide waste problems are the same, the method of applying alkaline chlorination varies. Based on its experience in over 100 such installations, Wallace & Tiernan is prepared to suggest the proper equipment to suit your particular plant.

W&T AUTOMATIC CONTROL

The precision chlorinators for which Wallace & Tiernan has been known for thirty-nine years have been combined with newly developed instruments to make possible the automatic control of alkaline chlorination treatment — an assurance that cyanides are destroyed — and at minimum chemical costs.
Eliminate guess work on your cyanide waste disposal — write today for further information.



W&T Program Controlled Chlorinator

WALLACE & TIERNAN
COMPANY, INC.
CHLORINE AND CHEMICAL CONTROL EQUIPMENT
NEWARK 1, NEW JERSEY • REPRESENTED IN PRINCIPAL CITIES

B-77

Personals

development of many United Chromium products and processes now widely used in the metal finishing industry.

He co-authored the paper, "Self-Regulating High-Speed Chromium Plating" presented at the Annual Convention of the American Electroplaters' Society at Boston in June, 1950 and is a holder of the Bachelor of Science degree of the University of Pennsylvania from which he was graduated with honors in 1935.

Manuel Ben, senior research engineer at the AC Spark Plug Division of General Motors Corporation at Flint, Mich., has been transferred to the Research Laboratories Division of GMC at Detroit where he will take on duties as senior research chemist. He is also President of the Saginaw Valley Branch, A. E. S.

Francis J. Frasor has been named Purchasing Agent for The Diversey Corporation, Chicago.

Frasor

Frasor has had 14 years experience in the purchasing field. Prior to joining Diversey he served as procurement coordinator for the Koppers Company, Incorporated of Pittsburgh in their Chicago office.

Hugh V. McGuire has been named sales representative on the staff of Jack Steele Company, Architects-Engineers, Philadelphia, Pa.

McGuire for the past thirteen years has been with the Hanson-Van Winkle-Munning Company where his work covered export trade, graphic arts, plant process layout, and specialized engineering sales. He has an A.B. degree from Rutgers. In his new position he will be responsible for coordinating the Company's newly extended engineering facilities for metal finishing which includes planning and consulting services for process layout, as well as all utilities and building structures.

Joseph E. Rhoads has been named by Enthone, Inc., New Haven, Conn., as Service Engineer covering the territory of

Rhoads

western New York and Pennsylvania, the states of Ohio and West Virginia and northeastern Kentucky. He will work in conjunction with the Sales Engineering Staff of R. O. Hull & Company, Cleveland, Ohio, exclusive Enthone products distributors in that territory.

"Joe" Rhoads comes to Enthone with seven years of experience in the metal finishing field and a degree of B.S. in Metallurgical Engineering from Case Institute of Technology. After two years of employment with Brown-Lipe-Chapin Division, General Motors Corporation, Elyria, Ohio, he became a part owner and vice-president of The Progressive Plating Corporation, Elyria. He relinquished his interest in this job plating company to become General Manager of The Plating and Galvanizing Company and Assistant to the Executive Vice-President of The Cleveland Chain and Manufacturing Company, both of Cleveland.

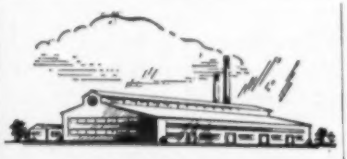
C. H. Wiles has been named Purchasing Agent for the Kuehne Manufacturing Company, Mattoon, Ill., according to a recent announcement which also stated that any communications or correspondence regarding purchases made by this company should be directed to his attention.

C. A. (Red) Sayers, formerly J. J. Siefen Company salesman in Indiana and Ohio, has been transferred to 1981 Seymour Ave., Cincinnati 37, Ohio, to cover the

EXTRA HIGH QUALITY 99.7+% PURE

CHROMIC ACID

TECHNICAL GRADE—FLAKE



DEPENDABLY UNIFORM

Our plant is modern; beautifully equipped; operated by men who are proud of the product they make.

FRIENDLY, PERSONAL SERVICE

You can get a quick, unequivocal "Yes" or "No" on your Chromic Acid requirements from interested owner-principals who value your business.

We have yet to have a legitimate complaint on the quality of B.F.C. Chromic Acid. Its chemical analysis is as fine as its physical appearance!

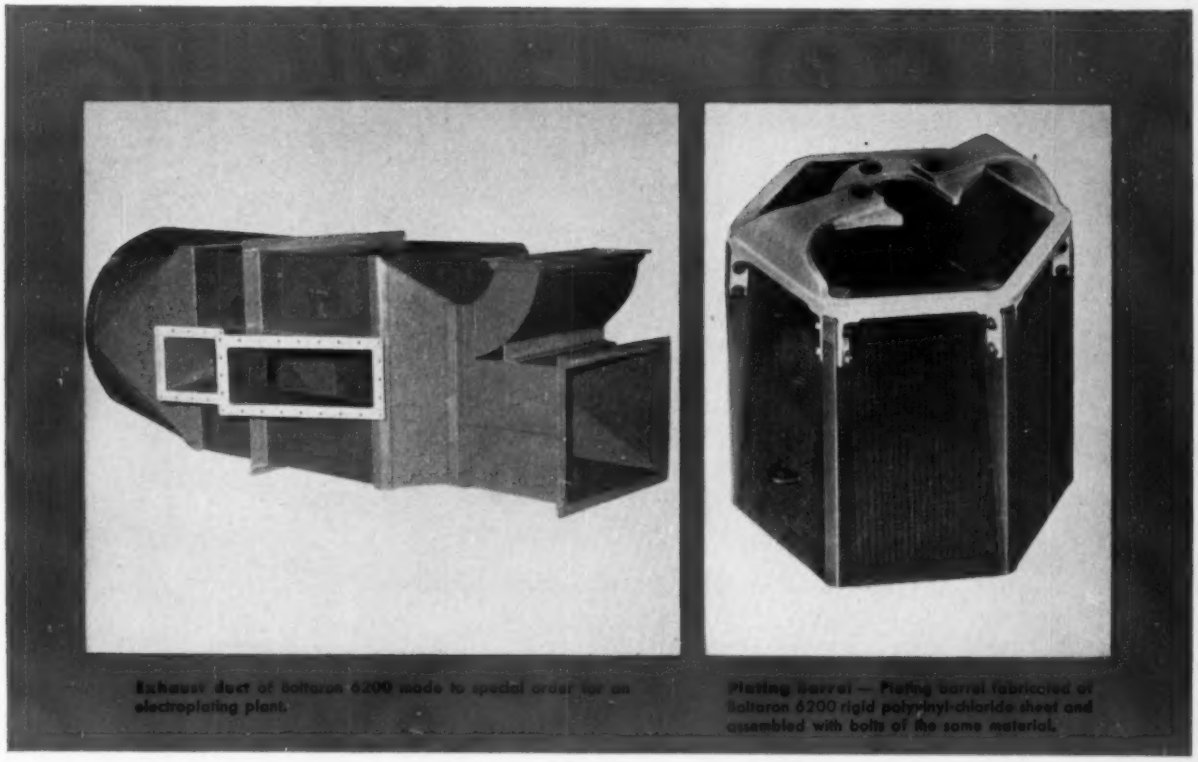
One Price. One Standard of Quality and Service to all—whether the market is short or long. Distributor Stocks in many Principal Cities.

BETTER FINISHES & COATINGS, INC.
268 Doremus Avenue, Newark 5, N. J.
122 East 7th St., Los Angeles 14, Calif.

Is corrosion costing you money?

WRITE FOR FACTS ON RIGID, NON-PLASTICIZED *Boltaron* 6200

A BOLTA-HARTWELL PRODUCT — **POLYVINYL-CHLORIDE**



Exhaust duct of Boltaron 6200 made to special order for an electroplating plant.

Plating Barrel — Plating barrel fabricated of Boltaron 6200 rigid polyvinyl-chloride sheet and assembled with bolts of the same material.

Boltaron 6200 is the outstanding corrosive-resistant material on the market today and retains the exceptional properties of unmodified Polyvinyl-Chloride. It is a superior, chemical resistant product particularly adaptable to the plating industry for exhaust systems, acid and alkali baths and for carrying corrosive solutions of all kinds.

Availability: *Sheet Stock* in sizes approximately 30″ x 60″ — 1/32″ to 1″ thick; *Bar Stock* in 10′ lengths, ¼″ to 2″ in diameter; *Pipe* in ¼″ to 2″ sizes and in 10′ and 20′ lengths; may be threaded using ordinary pipe dies; *Fittings*, standard, threaded I.P.S. fittings carried in stock in ¼″ to 2″ sizes.

National distribution has been established through strategically located fabricators in the United States, selected and trained by the Hartwell Company to efficiently and economically use Boltaron 6200 for outstanding results. Direct your inquiries to

H. N. HARTWELL & SON, INC.

Industrial Plastics Division • Park Square Building, Boston 16, Mass.

PROPERTIES OF BOLTARON 6200

(Write for specific results of ASTM tests.)

Chemical Properties — Outstanding chemical resistance to organic and inorganic acids, alkalies, alcohol and foodstuffs. Laboratory tests are continuously carried on. Complete information available on request.

Thermal Properties — Excellent low temperature factor, high heat distortion temperature, low coefficient of expansion, non-flammable.

Mechanical Properties — Great strength, light weight, high impact strength, non-toxic, ability to be drawn, formed, molded, machined and welded by hot gas technique, good deformation and abrasion resistance.

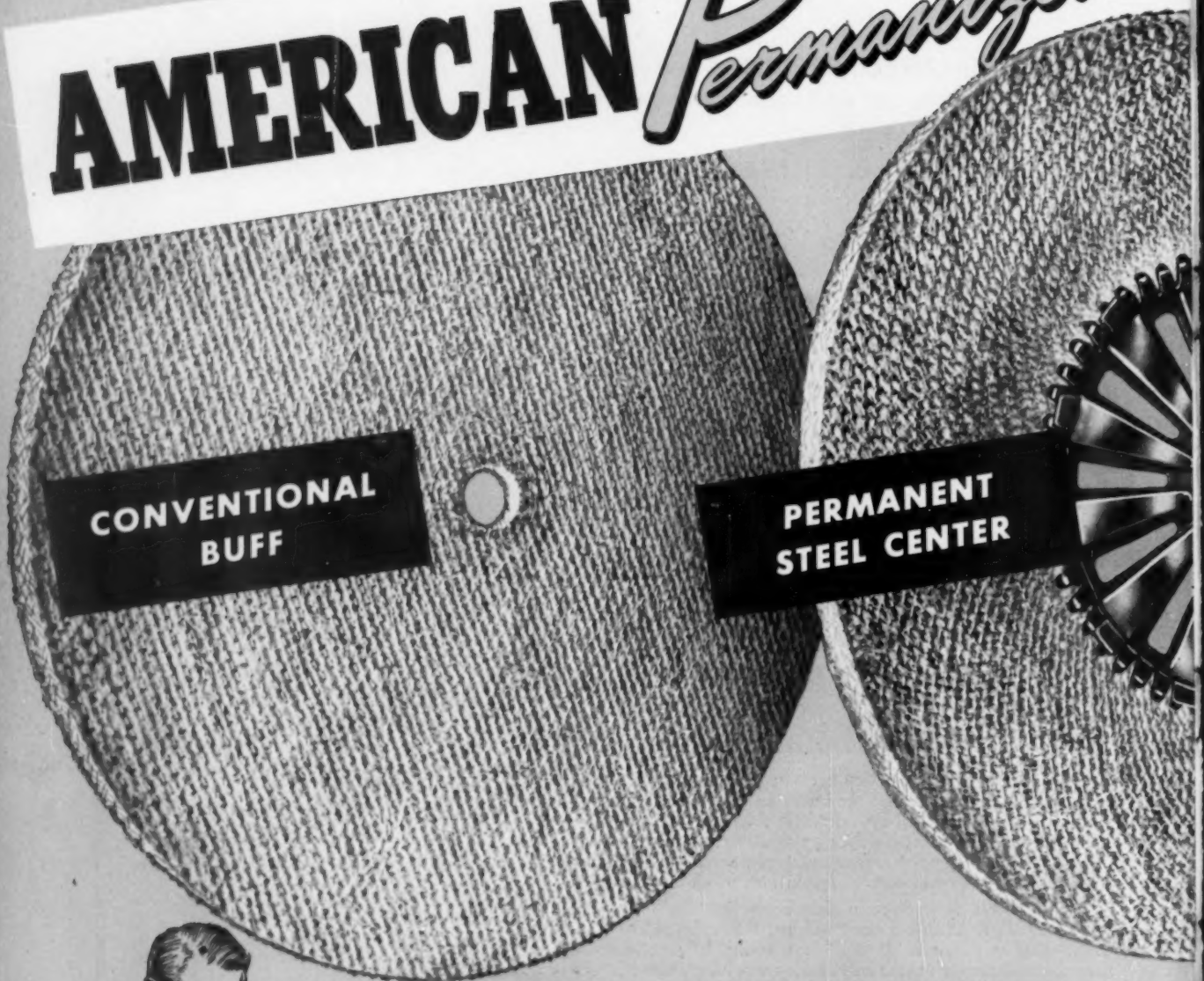
PARTIAL LIST OF USES

Electroplating	Food Processing
Anodizing	Dairy Products Processing
Dyeing & Bleaching	Textile Processing
Tanning	Photographic Processing
Brewing	Industrial Plumbing

Boltaron 6200 is manufactured in the United States

Out-wear...out-work...out-produce ALL OTHERS!

AMERICAN *Permanized*



EXCLUSIVE *permanizing* PROCESS

Permanently locks together the fibres of ALL-NEW, top-grade sisal fibre cloth woven to our specifications and bias cut. "Permanizing" reduces fraying, prevents excessive hardness, gives a perfect finish on every job. Eliminates many grease wheel operations.

Exclusive air-conditioned construction provides cooler running at faster speeds, increases machine output, *doubles buff life*. Choice of 3 types of centers match the "buff that's tough" to your need. Ask for a demonstration in your own plant.

BIAS SISAL BUFFS

NEW-PATENTED "CENTERLESS"
U. S. Pat. No. 2,582,506

PRE-ASSEMBLED UNITS
cut "down time" to seconds!

Cut "down-time", speed production with pre-assembled "CENTERLESS" Units

No other buff made has the Automatic Pre-assembly feature — a buff changing method so unique — so superior — that it has been granted a patent by the U. S. Patent office.

AUTOMATIC BUFF CO. DIVISION OF

American Buff Company

Chicago 16, Illinois CAlumet 5-1607

For the job that's TOUGH... Use an AMERICAN BUFF

EXCLUSIVE PATENTED
CENTERLESS BUFF PRE-ASSEMBLY
U. S. Pat. No. 2,599,785

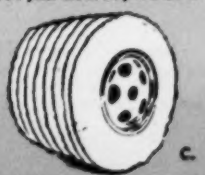
EASY AS A-B-C!

A. Lock individual buffs together to build up desired width.

B. Insert special flanges with "telescoping" hollow shafts.

C. Press shafts together . . . your "pre-assembled" unit is ready to install!

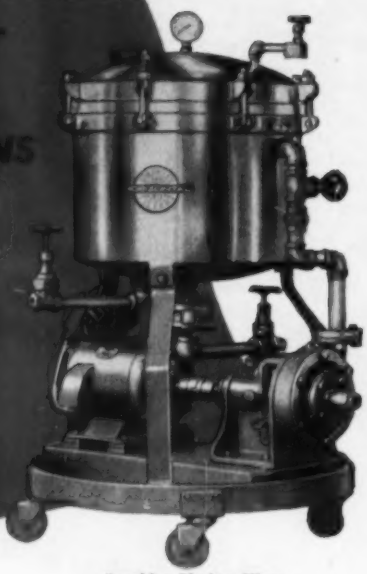
No need for high-priced workers to assemble units . . . your stock boy can do it!



Completely adaptable! Fits any size spindle shaft merely by varying diameter of arbor hole in flanges.

FOR LOW COST FILTERING OF PLATING SOLUTIONS

SPARKLER HORIZONTAL PLATE FILTERS



Sparkler Plating Filter
Model 18-D-6 Alliron
600 G.P.H. Portable

HERE'S HOW

★ On a horizontal filter plate it is possible to apply a thin pre-coat with about one-third the filter aid, and in one-third the time required for pre-coating a non rigid media or a surface in a vertical position. This saves time and filter aid.

★ With the Sparkler horizontal plate you can apply this thin pre-coat evenly over the entire plate surface and start filtering immediately with less pressure and obtain maximum consistant clarity right from the start up to the end of the cycle.

★ A filter cake on a horizontal plate will not crack, slip or fall off even with varying pressure or a complete shut-down of the filter. No pre-coat renewal is ever required after an interruption in operation.

★ When it is necessary to clean the filter, the Sparkler filter tank can be emptied in a matter of minutes with a minimum of loss of valuable plating solution.

★ Any grade of filter paper from fine to coarse can be used in a Sparkler filter. This makes it ideal for carbon treatment of solutions. Carbon mixed with water in a stand-by tank is circulated through a clean set of filter paper on the plates until a carbon cake is formed. The solution requiring carbon treatment is then circulated through the carbon beds without contaminating the plating tank or a shutdown of plating operations.

★ At the end of the cycle with a Sparkler filter you can blow-down with air and produce a relatively dry cake that can be disposed of in a trash can rather than washing it down the drain with attendant sewer clogging problems.

★ You will find your Sparkler plating filter positive and dependable from a standpoint of uniform high quality filtering and economical in labor and material.

SPARKLER

Sparkler representatives in all principal cities are ready to give you personal service on your filtering problems, and show how you can make a material saving in operating cost.

MANUFACTURING COMPANY
Mundelein, Illinois

Sparkler International Ltd.
Prinsengracht 876, Amsterdam, Holland

Sparkler Western Hemisphere Corp.
Mundelein, Ill. U.S.A.

Personals

southwest section of Ohio. He has 15 years' experience in the polishing and buffing industry.

Lawrence J. Hay, President of Plating Service Company, Chicago, was elected Chairman of the Chicago Electro-Platers Institute at its 18th Annual Meeting. He

Hay

succeeds **Carl F. Hansen,** Advance Tinning Company, Chicago. The Institute also elected **Charles E. Jensen,** Jensen Plating Works, Vice-Chairman, and **Robert L. Giesel,** Adolph Plating, Inc., Secretary-Treasurer.

Elected to the Board of Directors were **William G. Bott,** Aetna Plating Works; **Michael Mitchell,** Grunwald Plating Company; **John Lietz,** B. Mercil & Sons Plating Company; **Dominic Pacenti,** Metal Processing Company; **R. V. Leonardson,** Micro-Deburring Company; and past Chairman, Hansen.

Charles C. Conley has been appointed to the newly created position of Supervisor of Research of Houdaille-Hershey Corporation.

Conley

Mr. Conley has been associated with the company for nine years. Previously, his technical experience extended over a period of twenty years in various industries.

Charlie is a past president of the American Electroplaters' Scciety and has been active in the A. E. S. for many years, particularly in the Dayton and Detroit Branches of the Society.

Frederick H. Perfect, formerly Director of Research of Kawecki Chemical Company, has joined the Atlas Mineral Prod-

STUTZ Manufactured Plating Barrels

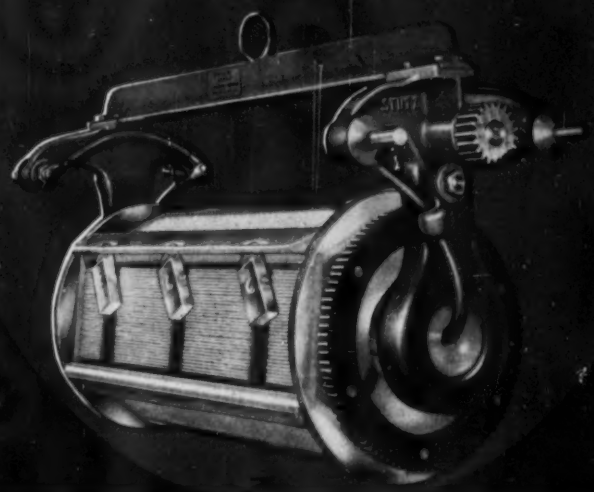
for

HEAVY DUTY PRODUCTION

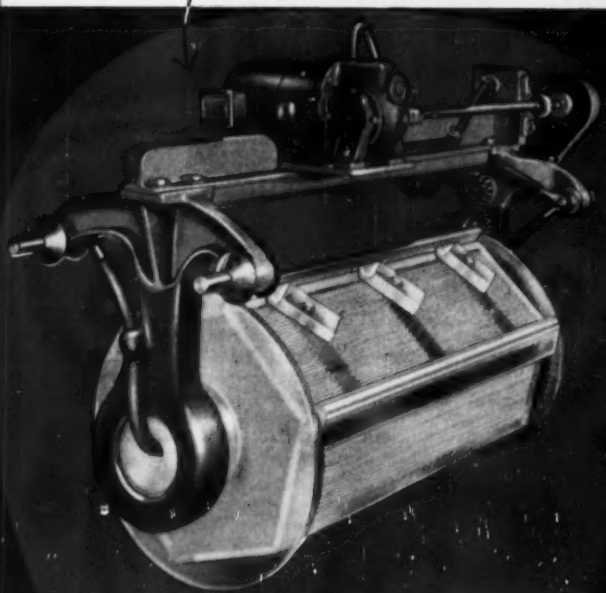
HIGHEST POSSIBLE CURRENT

COMPLETE CYCLE -ALL SOLUTIONS

Temperature to 185°F



Tanks provide for anode rods below solution level and plating cylinders fully immersed.



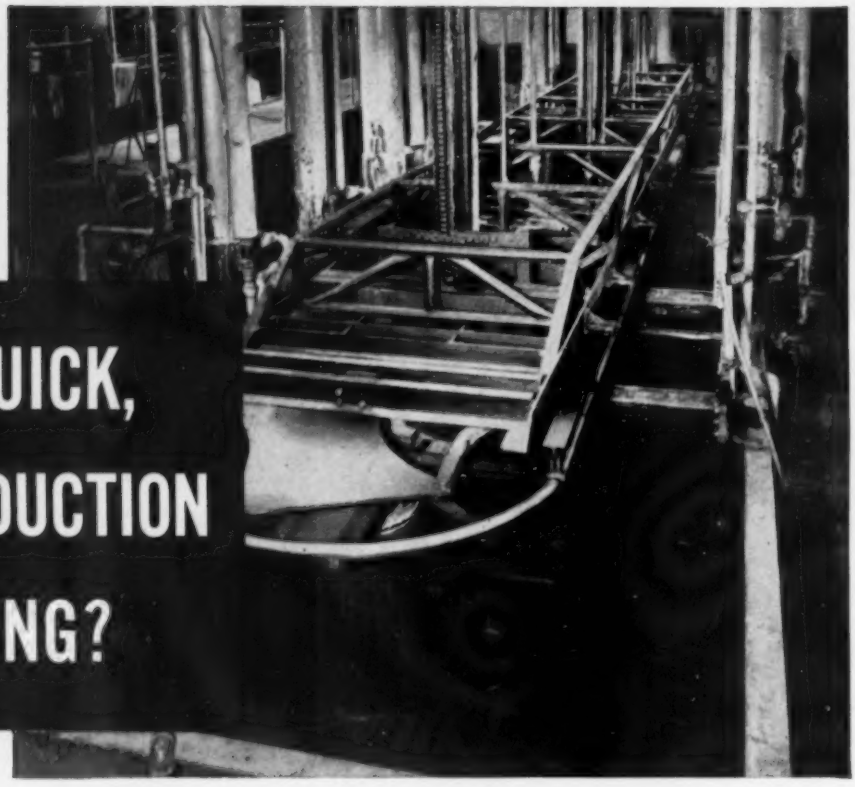
manufactured by

GEORGE A. STUTZ Manufacturing Company

1639-1647 Carroll Avenue
Chicago 12, Illinois

"Complete metal finishing equipment and supplies"

WRITE FOR DETAILS!



NEED QUICK, HIGH PRODUCTION CLEANING?

METAL MOULDINGS CORPORATION OF DETROIT DOES IT AUTOMATICALLY with UDYLITE EQUIPMENT!

"We had to have a FAST . . . yet SURE . . . method of cleaning our automotive stampings before plating. And these stampings are *really* intricate shapes. That's why we chose AUTOMATIC cleaning using a Udylite Full Automatic."

Yes, that's what the people of Metal Mouldings Corporation, Detroit, Michigan, told Udylite. They must combine a large volume of cleaning with no rejects. They found that Udylite equipment assured them of high production...while it saved time and manpower.

If you have cleaning problems . . . let the Udylite Corporation provide the answer. Your Udylite Technical Man will show you a faster, more economical, AUTOMATIC way to clean metal parts. Call him today or write direct for all the facts.

THE UDYLITE CORPORATION, DETROIT 11, MICHIGAN. *West of Rockies, L. H. Butcher Co., Los Angeles 23, California.*

PIONEER OF A BETTER WAY IN PLATING

THE Udylite CORPORATION
DETROIT 11, MICHIGAN

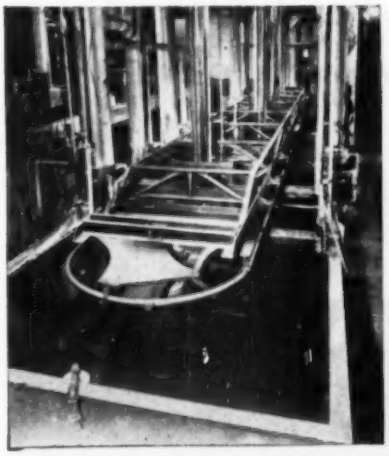
Udylite

METEX
CHROMEFOME
ZINCTEX
DYCLENE "E"
ROCHELTEX
ALUMETEX
ANODEX
TROXIDE
BLACKMAX
SOLVMAX "X"
CHROMETEX
ALUM-I-NIEL

CLEANING SUPPLIES WORK *FASTER, BETTER, MORE ECONOMICALLY!*

Whether used with Full Automatic Cleaning Equipment, still tanks or barrels, Udylite-MacDermid cleaners and compounds are faster . . . better . . . more economical! There's a special cleaner for every metal finishing purpose and prompt delivery is assured. Check these three general divisions . . . you'll see what a complete answer Udylite can give to *your* metal cleaning problems:

Typical Full Automatic Cleaning Installation at Metal Mouldings Corp., Detroit, Michigan



Steel Base—All cleaners in this general group are either electrolytic, soak, spray or general purpose types of compounds. They are especially adapted for cleaning steel base materials, either with direct or reverse current.

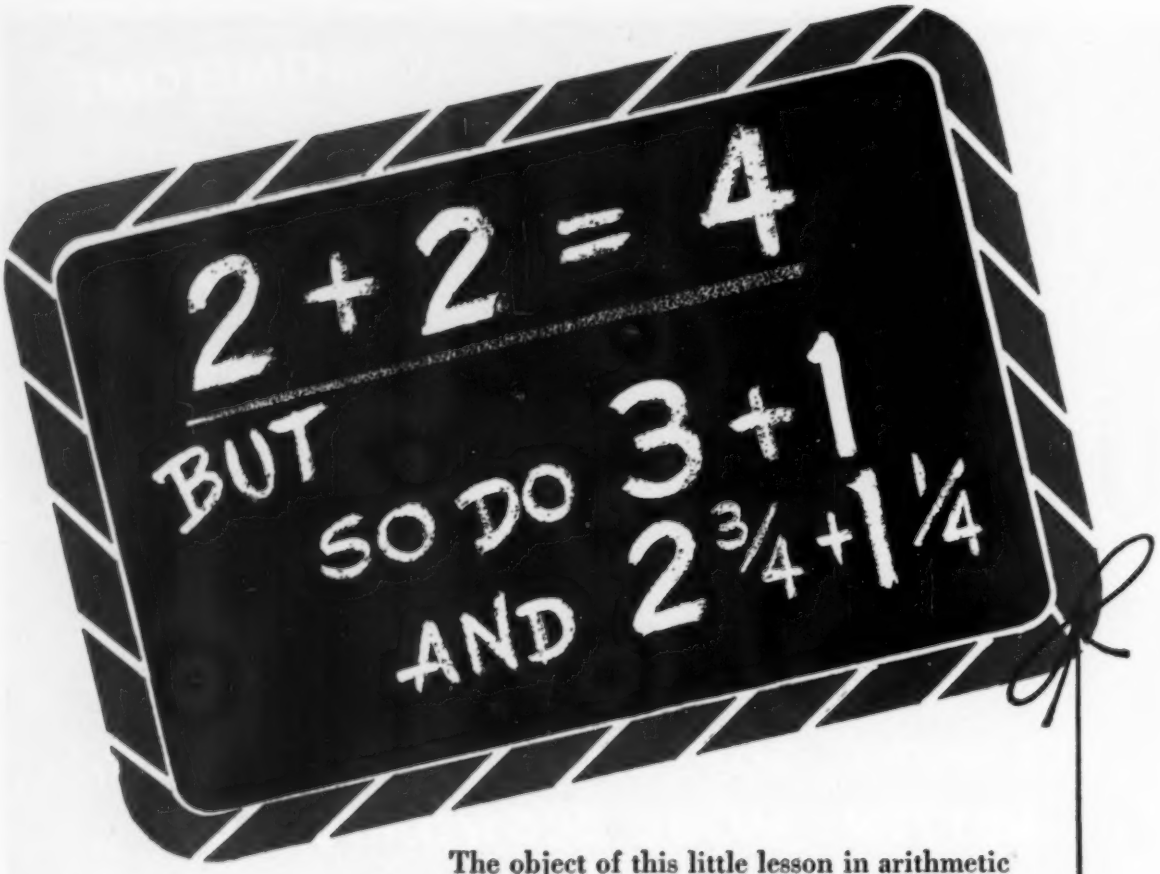
Brass and Die Castings—Cleaners in this group are composed of electrolytic, soak, spray and burnishing types of compounds. They are ideal for brass, zinc, and aluminum diecastings, since they will not discolor base metals.

Specialties—Compounds in this group fit a wide range of special metal cleaning problems. Write for full information on metal cleaners.

The Udylite Corporation carries a complete line of MacDermid cleaning compounds. For the answer to your needs, call your Udylite Technical Man. He can help select equipment and cleaners which give you an economical, FAST answer. Or, if you prefer, write direct. The Udylite Corporation, Detroit 11, Michigan. *West of Rockies, L. H. Butcher Company, Los Angeles, California.*

PIONEER OF A BETTER WAY IN PLATING

THE
Udylite
CORPORATION
DETROIT 11, MICHIGAN



The object of this little lesson in arithmetic is to prove that there are more ways than one to come to a conclusion. But, when it narrows down to Rectifiers, there is only one conclusion you can make. And that is... Green Rectifiers are unbeatable for quality, performance, and service.

IF YOU WANT THE BEST... Buy Green!

W. GREEN ELECTRIC COMPANY, INC.

SELECTRO PLATERS AND ALL TYPES OF RECTIFIER EQUIPMENT

GREEN EXCHANGE BUILDING 130 CEDAR STREET NEW YORK 6, N. Y.

RECTIFIER (G) ENGINEERS

REPRESENTATIVES:

- Walter R. Bimel, Indianapolis
- Crown Electric & Supply Co., Chicago
- Industrial Chemical & Equipt. Co., Minneapolis
- Metalcraft Supply Co., Newark
- Weaver Equipment & Supply Co., Houston
- W. M. Fotheringham, Buffalo

RESEARCH

LET'S ALL DO IT!

FREQUENTLY when the subject of financial support of the AES Research Program is being discussed, the remark is made—"Let the suppliers do it!"

This comment is only partly justifiable and when one considers that of the 307 sustaining members on the rolls for 1952 about 104, or 34 per cent, were suppliers, it becomes apparent that the suppliers are doing a pretty good job of holding up their end. But this is only as it should be since the AES Research Program cannot help but better the industry and the suppliers realize that the program will in turn benefit them—it is a sort of business tithing.

However, this program is not for the suppliers alone but for all of those who depend on finished metal products for their livelihood. True altruism is extremely rare but the AES Research Program is not designed for altruists but will give immediate returns for every dollar invested. Research already under way will help solve three of the most pressing problems of management—whether the firm be large or small.

FIRST—HIGH COSTS. Three of the projects now under way will by their results indirectly reduce costs.

SECOND—PRODUCT IMPROVEMENT. Application of the knowledge obtained from the projects now under way will greatly improve the quality of plate obtained, and improve the physical properties of the deposits.

THIRD—PUBLIC RELATIONS. The work of one of the projects—on waste disposal—is providing findings which make possible safe, economical disposal of plating chemical wastes. Lack of knowledge in this field has caused numerous cases of plant shutdowns, destruction to sanitation facilities and the loss of millions of game fish. Application of the findings of this project will improve methods of disposal by giving the metal finishing industry practical inexpensive disposal methods and will greatly enhance its position with its neighbors.

The research projects are all of such a broad nature that the results will be of benefit to all, but since they are so broad and since the findings of these projects cannot be marketed in any way which would make it economically possible for any one supplier to pay the cost of this research, it becomes necessary to make the support of the program a joint responsibility.

Fortunately, the per capita cost of this responsibility is extremely low. A sustaining membership involves a cash outlay of one hundred dollars. At present tax rates for an average operation, this outlay actually becomes somewhat nearer forty dollars. The savings to be derived from the application of the techniques from these research programs will more than offset this cash outlay and the benefits of product improvement and public relations can well be considered as a bonus.

In this day and age of inflated money, certainly a project or tool which will pay for itself in the first year or less is to be considered a good investment.

Considering the benefits to be derived by both plating management and suppliers, let everyone say "LET'S ALL DO IT!"—and become sustaining members today.

• • •

INVEST NOW!!!

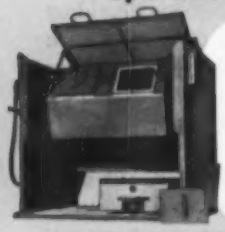
"YOUR BEST BET'S THE A.E.S RESEARCH PROGRAM"

It's the Finish that Counts

Roto-Finish COMPOUNDS AND CHIPS ARE MADE TO GIVE YOU THE PROPER FINISH ECONOMICALLY

There are other brands of materials that resemble Roto-Finish chips and compounds . . . but only Roto-Finish chips and compounds give you the *extra advantage* of continuous research by the company who originated the Roto-Finish processes. Roto-Finish chips and compounds are carefully manufactured so *you* obtain the best results on *your specific job*. To obtain the best results at the lowest cost . . . insist on ROTO-FINISH chips and compounds.

ROTO-FINISH puts your grinding, deburring descaling, polishing, britehoning or coloring operations ON A MASS PRODUCTION BASIS



SAVES MAN HOURS AND MONEY by eliminating hand finishing.
GIVES ABSOLUTE UNIFORMITY...in any quantity.
MAINTAINS PRECISION TOLERANCES.
CUTS FINISHING costs as much as 80%.
LOWERS INITIAL and MAINTENANCE costs;

ROTO-FINISH COST-FREE ENGINEERING SERVICE GUARANTEES RESULTS

Put the experience and facilities of Roto-Finish to work for you on *your special finishing problems.*

Send a few unfinished parts to us . . . plus a finished part as a guide. We *guarantee* that you will get the same results in your plant that we produce in our laboratory. There's no obligation.

Write for fact-packed Roto-Finish catalog for complete information.

Roto-Finish COMPANY

associated with The Sturgis Products Co.
3703 MILHAM ROAD, KALAMAZOO, MICH.

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FOREIGN REPRESENTATIVES: CANADA — Windsor — Roto-Finish Canada Limited • ENGLAND — London — Roto-Finish Limited — 39 Park Street — Mayfair • AUSTRALIA — Melbourne — A. Flavell Pty, Ltd. • HOLLAND — Delft — N. V. Roto-Finish Maatschappij — Rotterdamse — WEG 370A • AUSTRIA, GERMANY, SWITZERLAND — Frankfurt a.M. — Metallgesellschaft A.G., Germany • ITALY — Milan — Societa Roto-Finish a R.L. — Sesto S. Giovanni — Viale E. Marelli 31 • FRANCE — Paris — Societe Roto-Finish, 70 rue de la Republique-Puteaux (Seine) • BRAZIL — Rio de Janeiro — Commercial E. Industrial de Formos Werco, Ltds.

Personals

ucts Company Research Department where he will specialize in research on coatings, linings and adhesives. He is a graduate of Albright College.

Edward W. Ziminsky, formerly of General Motors Corporation, has joined Atlas and will be assigned to the study of special plant problems. Ziminsky holds a master's degree from Penn State College.

James T. Luscombe, sales engineer with Beckman Instruments, Inc., for the past two years, has been named sales manager for the South Pasadena company's Synchros division.

Luscombe **MacNamara**

The Iowa-born Luscombe received secondary education in Philadelphia and obtained a mechanical engineering degree in 1949 from the California Institute of Technology.

Dr. Elden D. Haller, senior sales engineer, has been appointed Eastern Sales Manager and will headquarter in a new Washington, D. C., office. Haller holds a doctor's degree in chemical engineering from Ohio State University. Before joining Beckman in 1942, he was chief chemist at the National Lime and Stone Company, Findlay, Ohio, and technical editor with the Ordnance section of the War Department.

John D. MacNamara has been appointed Field Sales Manager. Formerly textile industry sales manager for the Minneapolis-Honeywell Regulator Company, MacNamara will supervise the efforts of Beckman's expanded national field force to provide more complete factory assistance for the research and process industries.

John F. Maisch has been elected Treasurer of E. F. Houghton & Company, Philadelphia. Mr. Maisch has been Controller of the Company since June, 1950, when he came to Houghton from Lybrand, Ross Brothers and Montgomery, a Philadelphia accounting firm. He succeeds **William F. MacDonald** who has been holding the offices of President and Treasurer but has relinquished the latter in order to give more time to his duties as President.

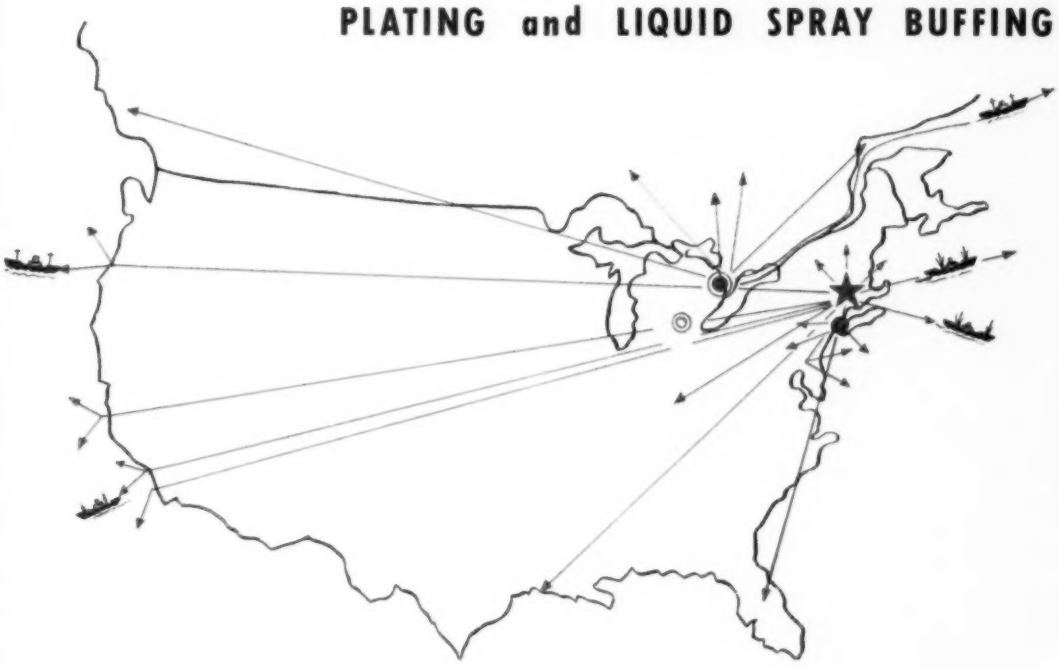
4 Pages for Your "WHERE TO BUY" File...

4 organizations

serving industry with the

"BEST IN ABRASIVE COMPOSITIONS and ELECTROCHEMICAL SPECIALTIES"

for BURRING, BUFFING, POLISHING, LAPPING, PLATING and LIQUID SPRAY BUFFING



★ **LEA OF WATERBURY** *(Original Company)* — Founded in 1923; serving the entire nation and many foreign countries with extensive manufacturing and distribution facilities; originator of many top quality products.

◎ **LEA OF MICHIGAN** — Serving industries in and around the Detroit area on certain LEA Products and nationally on others.

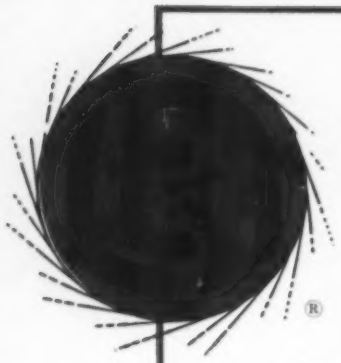
◉ **LEA OF CANADA** — Serving industries in Canada and England on many LEA Products.

● **LEA - RONAL** — Chemical Engineers — Specialists in the development and manufacture of electrochemical processes (see pages 3 and 4 of this insert).

PLUS- 65 Authorized Distributors in Principal Cities in the United States and Canada.

Export Agents: Gerard Kluyskens Co.
295 Fifth Avenue, New York 16, N. Y.

Don't Miss Pages 2-3-4



The important fact to keep in mind about Lea Abrasive Compositions and Plating Specialties is that they are manufactured by specialists long experienced in plating and surface finishing. Lea Products were developed by technical men who understand thoroughly the problems associated with these operations. Lea has aided hundreds of companies in improving plating and finishing techniques and in reducing unit costs.

On the reverse side of this file sheet, your attention was called to four companies manufacturing Lea quality products. The objective of these companies is to be able to serve industries more promptly, either through distributors or directly. Direct technical service can be provided wherever required. Plans for broadening these services are under consideration.

Because not all Lea Products are manufactured at this time by all four companies, we are designating manufacturing sources by the following names:

LEA OF WATERBURY . . . . . designated by Waterbury
LEA OF MICHIGAN . . . . . designated by Detroit
LEA OF CANADA . . . . . designated by Toronto
LEA-RONAL (see pages 3 and 4) . . . . . designated by Long Island City

All of the following products can be obtained from stock or promptly upon receipt of order.

LEA COMPOUND (Waterbury, Toronto) . . . industry's pioneering greaseless composition for burring, buffing, satin finishing, and flexible polishing; contains abrasives ranging from sharp, fast-cutting grits to fine, soft powders for delicate finishes.

LEAROK (Waterbury, Toronto) . . . compositions with "no free grease" designed primarily for buffing or coloring pieces which involve cleaning difficulties; does not pack up in recesses and ornamentations.

LEA GRIPMASTER (Detroit) . . . high bonding strength cement for polishing wheels and belts; used in setting up longer lasting polishing wheels and belts for both ferrous and non-ferrous metals.

AD-LEA-SIVE (Waterbury, Toronto) . . . glue-base adhesive for sizing, buffing and polishing wheels prior to application of Lea Compound, Leabrasive or other loose abrasives; available in bar form or bulk.

LEABRAMENT (Waterbury, Toronto) . . . greaseless, non-flammable, quick-drying, liquid abrasive for burring and polishing; can be sprayed or brushed on wheels.

LEA LIQUABRADE (Waterbury, Detroit, Toronto) . . . clean-working, fast-cutting and mirror-finishing liquid buffing compounds, providing in effect continuous operations and substantial economies in compositions and buffs; clean and safe, non-flammable, non-explosive; many abrasive types and grain sizes for all non-ferrous metals, steel, stainless alloys, and plastics.

LEA SPRAY GUN MOVER (Waterbury) . . . air-actuated machine for mounting automatic spray gun; sprays liquid buffing compositions uniformly on wide face buffing wheels.

LEA LIQUALUBE (Waterbury, Toronto) . . . water soluble liquid lubricant for polishing wheels and belts; can be sprayed or brushed on.

LEA LUBAR (Waterbury, Toronto) . . . bar form lubricant for polishing wheels and belts where glazing is not a problem.

cLEAn GRAIN LUBAR (Waterbury, Toronto) . . . special bar form lubricant to eliminate glazing on polishing wheels and belts.

LEA LAPPING PASTE (Waterbury) . . . micron size controlled abrasive paste for accurate and fine surface finishing.

LEA SYNSTRIP (Waterbury) . . . high speed stripper for synthetic enamels; leaves non-ferrous surfaces smooth; no etching.

LEA COPPER-GLO (Waterbury, Long Island City) . . . (with LEA-RONAL Bright Copper Process). See page 4 of this insert for your files on "Where to Buy".

LEA KROMESAVERS (Waterbury) . . . mist preventive for chrome and other plating solutions.

LEATARDENT (Waterbury) . . . anti-stain dip emulsion; prevents staining and tarnishing of plated surfaces.

LEA LECTROMAG (Waterbury) . . . portable electrical instrument for measuring the thickness of non-magnetic coatings on carbon steel and iron.

LEA ANALYTICAL METHODS (Waterbury) . . . plater's short cut methods for analyzing plating solutions.

THE LEA MANUFACTURING COMPANY

16 Cherry Avenue • Waterbury 20, Connecticut

LEA MFG. CO. OF MICHIGAN
•
14066 Stansbury Avenue
Detroit 27, Michigan

LEA MFG. CO. OF CANADA, LTD.
•
370 Victoria Street
Toronto 2, Ontario, Canada

LEA-RONAL, INC.
•
42-48 27th Street
Long Island City 1
New York

Burring, Buffing, Polishing, Lapping, Plating and Spray-Buffing. Manufacturers and Specialists in the Development of Production Methods, Equipment and Compositions

NEW COMPANY— NEW SERVICE

2 Important Names Associated
Valuable Services Associated

Announcing **LEA-RONAL, INC.**

LEA with its many years of research and development in the broad field of abrasives compositions and electrochemical specialties now, *in addition to* its long established well-known activities, working closely with

RONAL long active as consultants and in the development of new processes for the electro-deposition of metals

The entire plating industry will benefit by this joint activity in connection with the study of plating problems and with the manufacture of advanced plating processes.

LEA-RONAL, INC., will take over the research, development and manufacturing facilities of RONAL CHEMICALS, INC., which has already brought out such effective plating processes as Ronal Bright Copper, Ronal Bright Silver, Ronal Bright Gold and Ronal Watershed. (See page 4 of this insert.)

THE LEA MFG. CO., INC. of Waterbury, Conn., continues as an independent company manufacturing and marketing the broad lines of Lea Finishing Specialties (see pages 1 and 2 of this insert) and has been given *exclusive* world-wide sales and distribution of RONAL BRIGHT COPPER which it has been marketing during the past two years under the trade name LEA COPPER-GLO. On other LEA-RONAL Products it will act as sales distributor in the State of Connecticut and in Western Massachusetts, as it does with many other resale items of interest to the plating and metal finishing field.

LEA-RONAL, INC., will take over the manufacture and sales control of former LEA Plating Specialties such as LEA NICKEL-GLO, LEA MIRROR-GLO, LEA CLAD BRIGHT CADMIUM PROCESS, etc. (see page 4 of this insert). In short, LEA-RONAL, INC., will specialize in the manufacture, sales and further development of plating processes while THE LEA MFG. CO., INC., will concentrate on products for polishing, buffing, burring, lapping, and similar surface finishing operations.

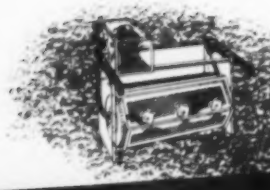
Sales of LEA-RONAL products will be made through established distributors in the metal finishing field throughout the country.

Lea-Ronal INC.

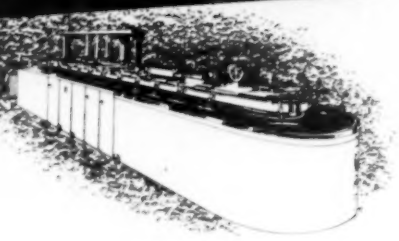
Main Office and Laboratory
42-46 27th Street
Long Island City 1, N. Y.

Manufacturing Plant
East Aurora Street
Waterbury 20, Conn.

Don't Miss Page 4



MORE GOOD NEWS FOR THE PLATER....



To the RONAL BRIGHT COPPER PROCESS, placed on the market about two years ago, have been added two more RONAL BRIGHT PLATING PROCESSES and several outstanding addition agents for providing trouble-free operations. We call your attention particularly to SUPERTARTRAL described briefly below. To refresh your memory on Bright Copper and to acquaint you with Bright Silver and Bright Gold, here are a few facts:

(A) **RONAL BRIGHT COPPER** . . . using LEA COPPER-GLO, makes it practicable to plate properly prefinished steel and die-castings with copper and then chrome plate directly without intermediate nickel plate or buffing operations; produces a soft, ductile deposit. (Marketed all over the world through The Lea Mfg. Co., Waterbury, Conn. See page 2 of this insert.)

(B) **RONAL BRIGHT SILVER** . . . using LEA SILVER-GLO, produces mirror-bright (with sodium) and semi-bright (with potassium) deposits; both plated from clear, colorless solutions at high current densities; no brightener breakdown.

(B) **RONAL BRIGHT GOLD** . . . using LEA GOLDEN-GLO, Bright Gold A for decorative appeal in alloy and colored deposits; produces brilliant, mirror-bright deposits directly from the bath without requiring subsequent buffing or coloring; brightness equivalent to bright nickel; Bright Gold S produces smooth bright ductile deposit for industrial and technical use.

(C) **LEA NICKEL-GLO** . . . an addition agent for barrel nickel plating solutions, producing bright plated surfaces and finer deposits of metal; no sludge; possible to eliminate burnishing of small articles.

(C) **LEA MIRROR-GLO** . . . an organic type brightening agent for room temperature still tank nickel baths.

(C) **LEA BRIGHT CADMIUM PROCESS** . . . produces bright protective coating for use on both ferrous and non-ferrous metals.

(C) **WATERSHED** . . . liquid rinse aid which promotes free rinsing and fast drying, hence reduces staining and spotting of plated pieces.

(C) **SPRAY STOP** . . . organic liquid producing a foam blanket on chrome baths, eliminating dangerous mists and sprays.

(C) **CUPRALL** . . . cyanide copper addition agent producing buffable copper deposits where brilliance is not required.

(C) **WETTING AGENT CW-6** . . . stable agent for copper cyanide bath, particularly RONAL, to make bath tolerate certain impurities accidentally introduced and where immediate carbon treatment is not practicable.

(C) **SUPERTARTRAL** . . . exceptionally effective addition agent for cyanide copper baths, particularly RONAL, producing smooth deposits and excellent anode corrosion.

NOTE: Symbols A, B, and C above have the following meaning:

(A) Manufactured by Lea-Ronal, Inc., but marketed exclusively all over the world by The Lea Mfg., Co., Waterbury, Conn.

(B) Manufactured by Lea-Ronal, Inc., and marketed through Lea-Ronal distributors.

(C) Plating Specialties, formerly made by The Lea Mfg., Co., Waterbury, Conn., now being made by Lea-Ronal, Inc., and distributed as are the items under classification "B" above.

Lea-Ronal Inc.

Trade Literature

L—600. Resin-Bonded Laminate Products—The Chemical Corporation, Springfield 9, Mass., has issued an 18-page brochure containing detailed data on tanks, ducts, hoods, stacks and waste pipe of resin-bonded Fiberglas construction. Physical properties for Pla-Tank products are given along with a resistance table which details recommendations for specific uses. Also outlined are general rules concerning the use of Pla-Tank in corrosive applications. A discussion of how to test the material for an application requiring chemical resistance is also included. For your copy of the data sheets use Reader Service Card.

L—601. Rodine Brochure—The American Chemical Paint Company has just issued a new 4-page brochure on Rodine pickling acid inhibitors. The descriptive folder has been revised both in its subject matter and its format and is illustrated with photomicrographs, tables, 2 figures and several photos showing typical uses of the material. For your copy of this four-color folder use Reader Service Card.

L—602. H-VW-M Rheostat Bulletin—A new bulletin, offered by Hanson-Van Winkle-Munning Company, Matawan, N. J., describes and illustrates the new H-VW-M tank rheostats. It lists standard ratings and sizes of these rheostats, describes rheostat mountings, simplified switching system and the short circuit switch required for striking chromium or nickel on die castings. The design features that practically eliminate all switch failures by excessive heating are also described. Photographs and drawings show front, rear and side views of the rheostat. A schematic drawing shows a typical rheostat-to-tank hookup.

The bulletin also gives suggestions for selecting and ordering a tank rheostat to protect it from overloads due to changes in work area, solution temperature or line voltage. For a copy of Bulletin TRA-527P write to Hanson-Van Winkle-Munning Company, Matawan, N. J., or use Reader Service Card.

L—603. Black Magic S.S. Blackening Process—The Mitchell-Bradford Chemical Company, 2448 Main St., Stratford, Conn., announces a new Black Magic S.S. process for blackening stainless steels, cast and malleable irons. Black Magic S.S. is a one salt mixture, one bath process operating at a temperature of 255° to 260° F.

The material produces a lustrous, adherent black finish on stainless steels, cast and malleable irons which will not chip, flake or peel. Immersion time in the blackening solution is from 5 to 15 minutes.

The process is a very economical and an inexpensive finish to apply—the cost of chemicals is less than ¼ cent per square foot. For your copy of detailed literature on the process use Reader Service Card.

L—604. Mylar Properties Bulletin—The Film Department of E. I. duPont de Nemours & Company, Inc., Wilmington, Del., have issued technical bulletin No. 1-2-53 containing a complete description of the physical, electrical and chemical properties of their new polyester film—Mylar. The 17-page bulletin on this new tough durable material which is impermeable to a number of organic and inorganic gases is profusely illustrated with photos, figures and tables. For your copy of this informative bulletin use Reader Service Card.

L—605. UV and Visible Spectrophotometer Catalog—An inclusive 28-page catalog of Beckman ultraviolet and visible spectrophotometers—picturing all sample cells and other accessories—has just been released by Beckman Instruments, Inc.

The two-color brochure contains detailed descriptions and illustrations of the Model B and DU Spectrophotometers—precision instruments which measure and identify substances by passing light through them.

Such well-known auxiliary units as the flame, reflectance and fluorescence attachments also are described. These multiply the analytical uses of spectrophotometry without requiring a heavy outlay for new basic instruments. The catalog features an extensive section treating the

How To Save Money With BUNATOL

It's easy to use BUNATOL No. 1002 Paste as it not only provides the best rack insulation but is also being used to insulate and protect anode baskets, pails, tank screens, fans and housings, drain boards, small tanks, valves, piping, and to repair plating barrels and other equipment. Instead of sending the work out, at great expense, do it yourself.

BUNATOL No. 1002 Paste is designed especially for insulating plating racks; that is why it makes a better insulation. The Primer is a single-coat job that saves time and labor and provides tremendous adhesion. The Paste coating gives great toughness and wear resistance, and chemical resistance to withstand all plating solutions and chemicals. Naturally, when such a fine coating is used to protect equipment from corrosion and chemical attack, it does give results.

No. 1002 Paste is a 100%-solids liquid that in a single dip coat will pick up a heavy insulation. It is permanently flexible, extremely tough to stand wear and scuffing, and will withstand all plating solutions. In many cases the insulation will outlast the rack.

Perhaps we can help you save money and time. Why not write and let us send complete information about BUNATOL Paste insulation and its many uses?

NELSON J. QUINN COMPANY
TOLEDO 7, OHIO

Trade Literature

complete line of Beckman spectrophotometer cells, interchangeable sample compartments and cell adapters. Copies can be obtained from Beckman Instruments, Inc., South Pasadena 1, Calif., through requests for Bulletin 303-72 or by using Reader Service Card.

L—606. Bulletin Describes Rubber Lining Tanks, Valves, Fittings—An illustrated, two-color, 8-page bulletin describing the advantages and application of rubber lining to steel tanks, drums, pipes, valves, fittings and pumps has recently been published by the Protective Coatings Division of Metalweld, Inc., Scotts Lane and Abbotsford Ave., Philadelphia 29, Pa. Included in the bulletin are important tables giving the resistance characteristics of MW rubber lining to inorganic acids, salts and alkalies, organic materials and a wide group of miscellaneous materials. Details on the chemical, abrasive and temperature resistant qualities of rubber linings and the different types of linings available are also given.

Plant facilities for cementing, lining, and vulcanizing all types and sizes of equipment are illustrated, and the B. F. Goodrich Vulcalock Bonding Process, which joins rubber and steel together with a bond strength of over 500 psi, is described. For your copy of the bulletin, use Reader Service Card.

L—607. Atlas Powder "Chemmunique"—First issue of a new pocket-size, three-color publication called "Chemmunique" is made available to the chemical process industries by Atlas Powder Company, Wilmington 99, Del. The publication, to be issued on alternate months, presents helpful information on new and old uses of Atlas chemical products and Darco activated carbons, written in nontechnical fashion and illustrated with color cartoons. For your copy of this new booklet use Reader Service Card.

L—608. Chart of the Nuclides—Nearly 1300 different kinds of atoms now known to exist are shown in a new chart being distributed by the General Electric Company. This is the fourth edition of the chart which includes information released up to November, 1952. Dr. John R. Stehn, Knolls Atomic Power Laboratory physicist who prepared the current edition of the chart, found it necessary to add 130 newly identified nuclides in the new version. Some changes were also made in data cited for 980 of those shown previously. A total of 1,274 nuclides are now shown. Copies of the chart, and an eight-page booklet describing it, may be obtained without charge, on request to the General Electric Company, Dept. 2-119, Schenectady, N. Y., or through use of Reader Service Card.

L—609. Heat Exchanger Catalog—National Carbon Company, a Division of Union Carbide and Carbon Corporation, announces the publication of a new Catalog Section covering its "Karbate" Brand Impervious Graphite standard heat exchangers. The Catalog fully describes Series 310A and Series 90A heat exchangers, which feature lower cost per unit area of heat transfer surface. The new exchangers employ completely removable "Karbate" impervious graphite tube bundles with stainless steel baffles, separate and removable "Karbate" impervious graphite fixed and floating end covers. A copy of Catalog Section S-6740 may be obtained by writing National Carbon Company, a Division of Union Carbide and Carbon Corporation, 30 E. 42nd St., New York 17, N. Y., or through use of Reader Service Card.

L—610. Electro-Forming and Deposition Bring New Latitude to the Designer—A 2-page illustrated reprint by The International Nickel Company, Inc., describes two developments in the plating field that widen the scope of the designer. Heavy, uniform nickel coatings

WELCOME...

to our friends in AES

. Of particular interest is the announcement of our *NEW* patent No. 2,637,957 granted May 12, 1953.

. The *NEW Pressure-Cooled* buff is now stocked in all sizes from 8" to 20". The *NEW Aircon®* wheel is stocked in sizes from 7" to 16"

VISIT US AT CONVENTION HEADQUARTERS

CALL AND INSPECT OUR COMPLETE LINE

NOTICE: The Pressure-Cooled Buffs and Aircon® Wheels are covered by U. S. patents No. 2,519,275 and No. 2,637,957. Other U. S. and Foreign patents pending.

PRODUCTS BY UB UNITED BUFF

UNITED BUFF PRODUCTS corporation

233 OAK STREET PASSAIC, N. J.

WAREHOUSE STOCKS IN PRINCIPAL CITIES OF U. S. AND CANADA FROM COAST TO COAST

FOR PRECISION STOPS . . .

IN SELECTIVE PLATING . . .

MICCROSTOP

. . . is designed to achieve an accurate line of demarcation in all plating cycles. It will go through cleaners and hot solutions without losing its exceptional adhesion, unsurpassed on sharp edges. The finest all purpose stop-off lacquer on the market today.

MICCROMASK

. . . is specifically designed for maximum adhesion in hard chrome plating. It will hold to a fine line and may be easily removed after plating. Dries rapidly. Multiple coats will take any long cycle without treeing.

Note: Both MICCROSTOP and MICCROMASK may be removed easily in MICCROSTRIP A.

MICCROWAX

. . . C-562 is the outstanding product for the most efficient method of selective hard chrome plating. Melting at 180°F, it is especially applicable for flat surfaces and sharp edges, where dipping is feasible.

. . . C-600 will take all plating cycles without losing adhesion. Melting at 300°F, it is not affected by temperatures, acids, or caustics used in any plating operation.

Both MICCROWAX C-562 and C-600 may be reused. Only one dip tank is required. Both harden immediately, cutting down application time to a minimum.

Write for detailed bulletins giving full information on the above products.

MICCRO Products

MICHIGAN CHROME
and Chemical Company
8615 Grinnell Avenue • Detroit 13, Michigan

BEFORE YOU SAY "*We Don't Need It*" THE ADVANTAGES OF ALL OF THESE

FOR ZINC PLATING

ROHCO 100 BARREL ZINC BRIGHTENER for brilliant deposits, maximum coverage and lowest cost.

ROHCO 303 STILL ZINC BRIGHTENER for highest lustre zinc, used with or without conversion or bright dips.

ROHCO ZINC PURIFIER to keep zinc baths in tiptop shape.

NO-FLASH to control foaming and explosions in most plating baths and alkaline cleaners (except chrome).

FOR CADMIUM PLATING

ROHCO 20XL (Liquid or Powder) gives brightest cadmium; minimizes cadmium consumption by improving uniformity of deposit.

ROHCO 50XL (Powder) for highest production rates of bright cadmium.

AIRCRAFT BLACK CADMIUM PROCESS for adherent, attractive blackening of cadmium.

FOR CHROMIUM PLATING

ROHCO NO-CRO-MIST® controls chrome fumes; solves ventilating and heating problems; saves chromic acid.

ROHCO RINS-AID sheds water; prevents chrome stain; improves drying.

CHROMETER—a special hydrometer which gives direct chromic acid content at the bath operating temperature.

HULL CELLS AND RECTIFIERS for speedy, positive catalyst control.

FOR ALL PLATING

ROHCO RINS-AID sheds water; improves drying; prevents staining.

COMET RECTIFIER is the newest, most convenient rectifier; dual range 6 and 30 amperes, perfect voltage control, filtered output, automatic timer. Other rectifiers are B-1000 and B-267.

ROHCO CURRENT TESTER enables platers to detect and correct the hidden troubles of rectifiers that ordinary meters don't indicate.

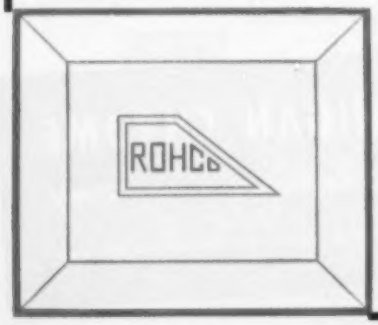
HANGING HULL CELL is a new device for making plating tests under production conditions.

HULL CELL UNITS of high temperature lucite. See illustration, from left to right: Model "W" Hull Cell with Immersion Heater and provision for Air Agitation; 267 ml Hull Cell; 1000 ml Hull Cell.

ANODES: Cast of various metals.

CATHODES: Zinc Plated No. 3 finish steel or polished brass.

Write for complete details, TODAY!



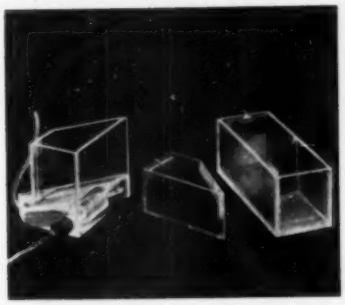
R. O. HULL & COMPANY, Inc.

Also Distributors of Enthone Products And Forcite Anode Baskets

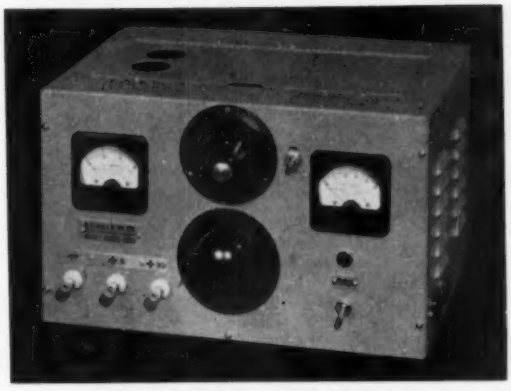
1302 Parsons Court **Rocky River 16, Ohio**

Canada: Armalite Company, Ltd.
Toronto 6, Canada

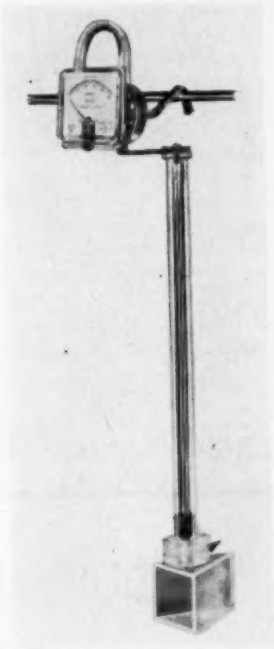
LOOK INTO ALL ROHCO PRODUCTS!



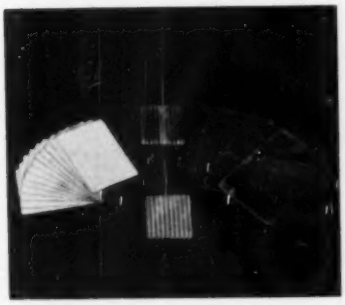
HULL CELLS



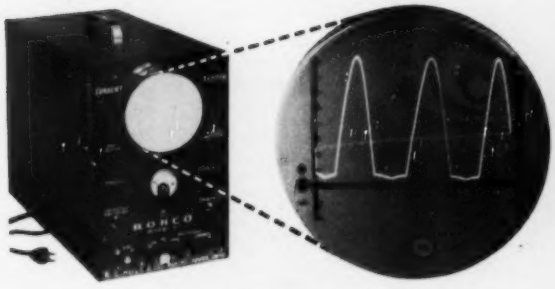
ROHCO COMET RECTIFIER



HANGING HULL CELL



ANODES & CATHODES



ROHCO CURRENT TESTER

Trade Literature

can be deposited on plastics, giving them a metal surface while preserving their light weight. Nickel may be the finish coat or may be used as a base for chromium or precious metals. Simple and complicated shapes can also be electroformed, on permanent or destructable mandrels, within tolerances of 2/10,000 inch. There is little limitation to the complexity of the shapes that may be produced. Rounds, squares, recesses, undercuts and other variations can be combined in a single design. Forty thousand finished pieces a week have been fabricated by electroforming. For your copy use Reader Service Card.

L—611. Brush Catalog—A new colorful, completely illustrated catalog of over 400 brushes of all sizes and types has just been issued by The Torrington Brush Works of Torrington, Conn. The catalog lists floor, bench, counter, glue and platers' brushes. Copies of the catalog will be sent on request. Use Reader Service Card.

L—612. Paint Stripping Instruction Sheets—A new 13-page fact sheet booklet of instructions on paint stripping has just been published by Octagon Process Inc., No. 15P Bank St., Staten Island 1, N. Y. It describes in detail and gives exact procedures for using eleven tailored types of Octagon Paint Strippers designed for stripping practically any finish from all metals and from all woods. There is also a hint sheet which gives valuable information on paint stripping generally. A handy, quick reference chart makes selection of the right stripper for the job easy. For your copy of the new booklet use Reader Service Card.

L—613. Aluminum Handbook—A 152-page informational handbook on aluminum sheet and plate has just been published by Kaiser Aluminum & Chemical Sales, Inc. The book includes discussions of the properties of aluminum, applications of sheet and plate alloys, fabrication and finishing methods as well as comprehensive tables covering availabilities, properties and other information of value to aluminum users. Copies of the handbook may be obtained by writing Kaiser Aluminum & Chemical Sales, Inc., 1924P Broadway, Oakland 12, Calif., or by using Reader Service Card.

L—614. Hard Rubber Pipe and Fittings Bulletin—A new heat and chemical resistant synthetic hard rubber compound, Tempron, is described fully in a new 4-page bulletin 96-A issued by the American Hard Rubber Company, 93P Worth St., New York 13, N. Y. Ideal for pipe and fittings, the material has greater rigidity, heat resistance and chemical resistance than other soft or hard nitrile-base compounds hitherto available. The bulletin gives complete information on pipe and fitting sizes as well as data covering the physical and electrical properties of Tempron. It also lists the many chemical solutions that Tempron can handle. For your copy use Reader Service Card.

L—615. Duroplastic Tanks Data Sheets—Duroplastic Tanks, 376 Washington St., Malden 48, Mass., announce the release of new data sheets on their products. Service Bulletin No. 1 details test results and field performance data on resistances of these glass-fibre reinforced tanks, hoods and ducts. Information is given on uses with plating baths, acids, and miscellaneous solutions. Standard tank sizes are listed in another bulletin. For your copies of the above literature use Reader Service Card.

L—616. "Good News About Electrocleaning Zinc-Base Die Castings" is the title of an interesting folder currently available from Oakite Products, Inc. It describes how Oakite Composition No. 95 effectively removes the film and over-

Serving the Cleveland Area

EQUIPMENT AND SUPPLIES
FOR
PLATING AND POLISHING

• • •

PLATERS SUPPLY COMPANY

2059 HAMILTON AVENUE
CLEVELAND 14, OHIO
TOwer 1-6670

DISTRIBUTORS FOR HANSON-VAN WINKLE-MUNNING CO.

Copper Platers Gain Extra Advantages

Improved Pyrophosphate process provides new operating economies; gives a smoother, easier-to-buff deposit

Many chromium plating difficulties eliminated

Over 700 commercial installations of the Unichrome SRHS Chromium Bath have provided the best testing and proving ground in the world. Case after case has shown that this bath virtually obsoletes the ordinary solution. Again and again, results have confirmed each improvement this solution offers; each difficulty it has reduced or eliminated. Here are its chief advantages:

Important chemical constituents of the bath are controlled automatically—maintaining the solution at top plating balance. This has slashed control time and maintained plating quality.

Higher plating speeds have been achieved—with plating time cut as much as 50% in some plants, and capacity of existing equipment increased.

This solution's wider bright plate range has reduced "burning" on edges and "missing" in recesses, thereby further cutting rejects.

In hard chromium operations, its greater leveling action has reduced polishing time. SRHS has also meant less loss of fatigue strength in plated steel.

Many of yesterday's headaches with chromium plating have been eliminated. If you're still struggling with an old fashioned bath it will pay you to call in a United Chromium engineer for complete facts.

ECONOMY IN TEMPERATURE-CONTROL COILS

No common plating room acid, except hydrofluoric, can attack tantalum metal. Unichrome Tantalum Coils, therefore, offer a money-saving means for controlling the temperature of acid solutions such as chromium plating baths. A New England company that installed two of them discovered after only one year that the coils had actually paid for themselves by eliminating both the cost of repair or replacement of former type of coils, and the downtime and loss of production normally experienced. At another plant, tantalum coils have given ten years service where they were expected to give only *five*.

With copper plating important in so many large volume operations, platers want to get the best quality finish possible at the lowest possible cost. The surest way to determine which process can do the job is to compare features.

All platers want certain features in a copper plating process. Fast plating speed, for example.

Individual plants, however, have special problems in connection with copper plating. They, therefore, choose a process which fills not only the basic requirements of good plating operations, but also provides extra advantages which can overcome their individual problem.

To more and more platers, the alkaline Unichrome Pyrophosphate Copper process seems to supply this ideal combination of features.

FEATURES THAT MAKE DOLLARS AND CENTS

The Unichrome Pyrophosphate Copper Bath has wide current density range—which it maintains through improved make-up. This means that high plating speed and range are sustained. As for the deposits, they are fine grained and ductile. The plate is exceptionally smooth and needs little or no buffing; often only simple chemical polishing suffices for direct chromium plating. All this without the need or expense of costly, hard-to-control brighteners.

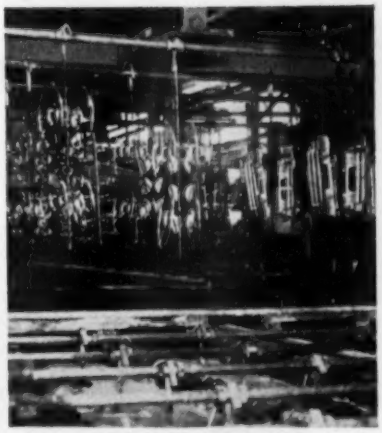
ANSWERS TO SPECIAL PROBLEMS

The problem of cyanide disposal grows more urgent by the week. A non-cyanide bath, Unichrome Copper helps to cut down the volumes of this toxic solution which must be treated, and the expense of treatment.

Empty nickel tanks don't earn money. Where such tanks are idle, they can be used for Unichrome Copper, since this moderate temperature bath will not harm plastic tank linings.

THE RIGHT COMBINATION TO THESE PLANTS

A tubular furniture manufacturer adopted Unichrome Copper because it deposited a smoother copper faster, and resulted in a brighter chromium finish. In addition, it permitted them to use the copper in their rubber-lined automatic nickel equipment without alteration—saving $25,000 installation cost.



Features of Unichrome Copper can pay dividends in busy plating installations like this.

A New England concern overcame roughness of copper deposits and buffing difficulties by switching to Unichrome Copper.

Another plater also found Unichrome Copper depositing smoother plate faster than previous bath.

A bicycle manufacturer was able to figure on substantial savings from Unichrome Copper when he saw the plating speed, smoothness and ease of buffing being obtained with bicycle parts.

★ ★ ★

Something every plater can always count on from United Chromium is service. The service and experience of a United Chromium engineer made available to users may mean still better finishing department efficiency. May they serve you? Bulletin CU-2 gives more data on Unichrome copper.

UNITED CHROMIUM, INCORPORATED
100 East 42nd Street, New York 17, N. Y.
Detroit 20, Mich. • Waterbury 20, Conn.
Chicago 4, Ill. • Los Angeles 13, Calif.
In Canada:
United Chromium Limited, Toronto, Ont.

Trade Literature

comes the obstacles that most commonly interfere with successful electroplating on die-cast zinc.

Among the advantages offered by this material, the folder states, are the following: (1) Brighter plating; (2) No anodic blackening; (3) Fewer rejects. Readers may obtain copies of the descriptive folder by writing Oakite Products, Inc., 140 Rector St., New York 6, N. Y., or using Reader Service Card.

L—617. Bulletin on Properties, Uses of New Structural Plastic—Complete engineering facts, including information on fabrication and design factors, physical strength and chemical resistance of unplasticized, rigid polyvinyl chloride Ampcoflex are provided in a new Bulletin 9-1 issued by the Atlas Mineral Products Company, 72 Ash Street, Mertztown, Pa. Resistance of the material to specific reagents at both low and high temperatures are given with a detailed tabulation of its physical properties.

Techniques of unplasticized, polyvinyl chloride fabrication are also discussed in the bulletin with illustrations of fume exhaust systems, tanks, ducts, dipping baskets and similar products. For your copy use Reader Service Card.

L—618. Finishing Systems Catalog—A new 16-page catalog on "Complete Finishing Systems" has just been published by Cincinnati Cleaning & Finishing Machinery Company, Schmidt Building, Cincinnati, Ohio. The new literature illustrates and describes a wide variety of finishing systems and equipment.

Both integral (self-contained) systems and unitized types are covered. The examples shown cover small and large parts, auto hardware, ordnance and similar finish applications.

Data are given outside of the installation examples which are handled in "case history" manner in substential detail. For your copy of the catalog use Reader Service Card.

L—619. Rubber Linings Bulletin—A new rubber linings bulletin just issued by the Protective Coatings Division of Metalweld, Inc., Scotts Lane, Philadelphia 29, Pa., contains detailed information on the chemical, abrasion and temperature resistance of rubber linings, together with tables on organic and inorganic acids and miscellaneous materials. This 8-page illustrated folder is available upon request. Use Reader Service Card.

L—620. Anodes and Chemicals Bulletin—A new 16-page, two-color bulletin, offered by Hanson-Van Winkle-Munning Company, Matawan, N. J., describes and illustrates a complete line of H-VW-M anodes, anode accessories, plating processes and plating chemicals. Specifications and recommended applications are given for nine styles of anode bags, three types of diaphragms and 12 types of anodes. The bulletin describes 16 different H-VW-M plating processes. It describes the types of deposit and lists special equipment that the different baths will plate.

The bulletin also describes 30 salts commonly used in electroplating baths; 11 brighteners used in H-VW-M solutions; six kinds of purification materials; and the oxidizing liquid used in copper, bronze and silver plating. It also lists the standard packages that these products come in. In addition, the bulletin tells how to test local thicknesses of electrodeposited cadmium, zinc, tin, copper and H-VW-M Albaloy. Four tables list the various times, temperatures and thicknesses of deposits made by the metals during test runs. To get Bulletin AC-107-P, "Anodes and Plating Chemicals", use Reader Service Card.

L—621. "Pik-Aide" for Acid Pickling Solution—The Mitchell-Bradford Chemical Company, 2448 Main St., Stratford, Conn., announces the release of literature describing a new product Black Magic "Pik-Aide". The material is a chemical solution which is added to hydrochloric, sulfuric and nitric acid pickling solutions to produce a brighter, uniform, faster and more economical pickling action with a minimum of attack on base metal. It is added to acid pickling solutions in the proportions of 2½ quarts to 100 gallons of pickling solution.

Six advantages from the use of Black Magic "Pik-Aide" in an acid pickling solution are detailed. For your copy of the bulletin use Reader Service Card.

FOR TANKS AND FUME SYSTEMS

HAVEG IS A LOGICAL ANSWER...

The work history of HAVEG in thousands of plants is of value to every engineer anxious to cut costs and resist corrosion: Here is a material that is economically molded into tanks, towers, valves, pipes, agers and agitators. HAVEG is not a lining or coating, and has uniform resistance to practically all acids, bases and salts, to chlorine and to many solvents and other chemicals excepting those of a highly oxidizing nature. It can be repaired and altered on the job.

Write for 64-page technical bulletin F-6. It shows tank sizes, installation and machining tips, complete chemical resistance tables. Write now! The Haveg factory is at Marshallton, Delaware (phone Wilmington 3-8884). Capacity has been increased, with deliveries improved. Why take less, when you can get proven, long-life Haveg?

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SALES ENGINEERS: Atlanta • Chicago • Cincinnati • Cleveland • Detroit • Hartford
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Tailored-To-Task Cutmaster Buffs
Run Cool - Won't Ravel
Cut Overhead Costs

Consult us now about your needs!

WILLIAMSVILLE BUFF DIVISION
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FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 641.

ACID PROOF EQUIPMENT *to* CONTROL

- ✓ Corrosion
- ✓ Contamination
- ✓ Corrosive Fumes
- ✓ Current Loss
- ✓ Acid Loss

LININGS

SEALON vinyl plastic.

Exceptional corrosion resistance—light weight, easily repaired. In many cases eliminates need of brick lining. Possesses electrical resistivity. Installed by experienced crews, completely electrically tested.

TANKS

For plating, anodizing, acid pickling, neutralizing and storage.

PIPE, DUCTS AND FITTINGS

PERMANITE fibreglass-reinforced plastic in bores from 1½″ to 36″ for ducts.

KNIGHT-WARE chemical stoneware in bores from 1″ to 60″ for drains.

Special shapes and fittings to order for both types.

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KNIGHT FUME WASHERS for elimination of acid fumes and mists.

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KNIGHT ACID CONCENTRATORS. A recent development proven in actual service, for recovery of chromic acid, nickel plating salts and other plating solutions.

PROTECTIVE COATINGS

PYROFLEX LACQUER, a formulation of inert synthetic resins for protecting metal, wood, concrete. Can be applied by brush or spray.

ACID PROOF CEMENT

A complete line of cements for use with brick or tile in floors, tank linings, walls, etc.

Knight equipment such as tanks, towers, concentrators can be shipped F.O.B. Akron or your equipment can be lined on the job by trained field crews.

Literature will be sent on request.

Maurice A. Knight Kelly Ave., Akron 6, Ohio

Acid and Alkali-proof Chemical Equipment

Trade Literature

L—622. Practical Nickel Plating—(Bulletin No. 77) is a 44-page general publication with over 40 illustrations, tables and charts issued by The International Nickel Company, Inc. Provides the designer, specifying engineer and user with basic information on electroplating and detailed information on nickel plating and its practices. Keyed bibliography suggests 41 sources of additional reading for those who want greater detail or have special interests. Information on the mechanical properties of deposits, plating conditions and commonly used solutions will be found. Recommendations are made on preparation of basis metals, recognition and correction of plating difficulties and purification of solutions. Thickness and type of nickel deposit for adequate service life in many corrosion resistant, industrial and electroforming applications are discussed. For your copy use Reader Service Card.

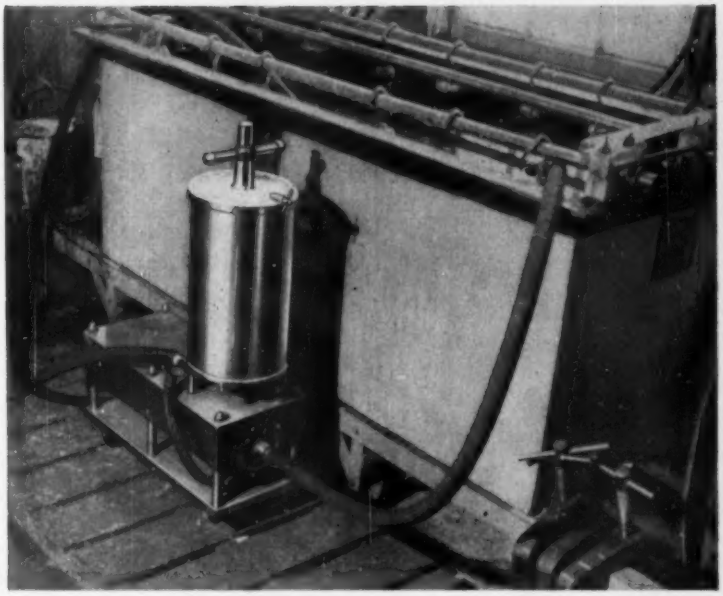
L—623. Bakelite and Vinylite Reference File—Properties and uses of more than 50 Bakelite and Vinylite plastics and resins are described and illustrated in the new, revised reference file published by Bakelite Company, a Division of Union Carbide and Carbon Corporation. The 16-page 1953 edition of "Condensed Reference File of Bakelite and Vinylite Plastics and Resins" contains 110 photographs showing applications and finished products. Short, accurate descriptions of the wide range of special and general-purpose Bakelite phenolic, styrene and polyethylene and Vinylite plastics and resins are presented in 22 categories under eight major headings:

Despite the limited space available for each of the 50 plastics, this new booklet contains essential information on: (a) Specific properties of the individual plastics; (b) their particular industrial or commercial applications; and (c) their ability to be molded, extruded, calendered or otherwise formed in manufacturing processes. For your copy of the "Condensed Reference File of Bakelite and Vinylite Plastics and Resins" write the Bakelite Company, 300-P Madison Ave., New York 17, N. Y., or use Reader Service Card.

L—624. Antara Chemicals Catalog—A new 28-page catalog has been issued by the Antara Chemicals Division of General Dyestuff Corporation. The catalog covers such product groups as detergents, wetting agents, emulsifiers, brighteners, sequestrants, and lists important application suggestions in a wide range of industries, including metal, paint, and other specialty fields. Copies of the catalog may be obtained by using Reader Service Card.

Here's how to cut your losses

get better finished plated work — save time and labor



The "Sealed-Disc" Filter will remove all dirt, dust, and sludge from your plating solutions. You'll no longer worry about pitting, spotting, poor adhesion, formation of nodules, etc.

More and more platers testify to the remarkable savings in operating time and labor that the "Sealed-Disc" Filter gives them. These cost-minded platers get better finished plated work and have found that their solutions last longer. "Sealed-Disc" Filters, designed to meet plating room requirements, are smaller, more compact and portable, than ordinary conventional filters.

Regardless of the size or type of your installation, there's a "Sealed-Disc" Filter to "fit your job." You can depend on a "Sealed-Disc" Filter for positive, trouble-free performance that's proof against even the invisible impurities that cause nodules and porousness, proof against losses caused by rejects and reworking. Write for complete details or contact your regular plating supplier.

ALSOP
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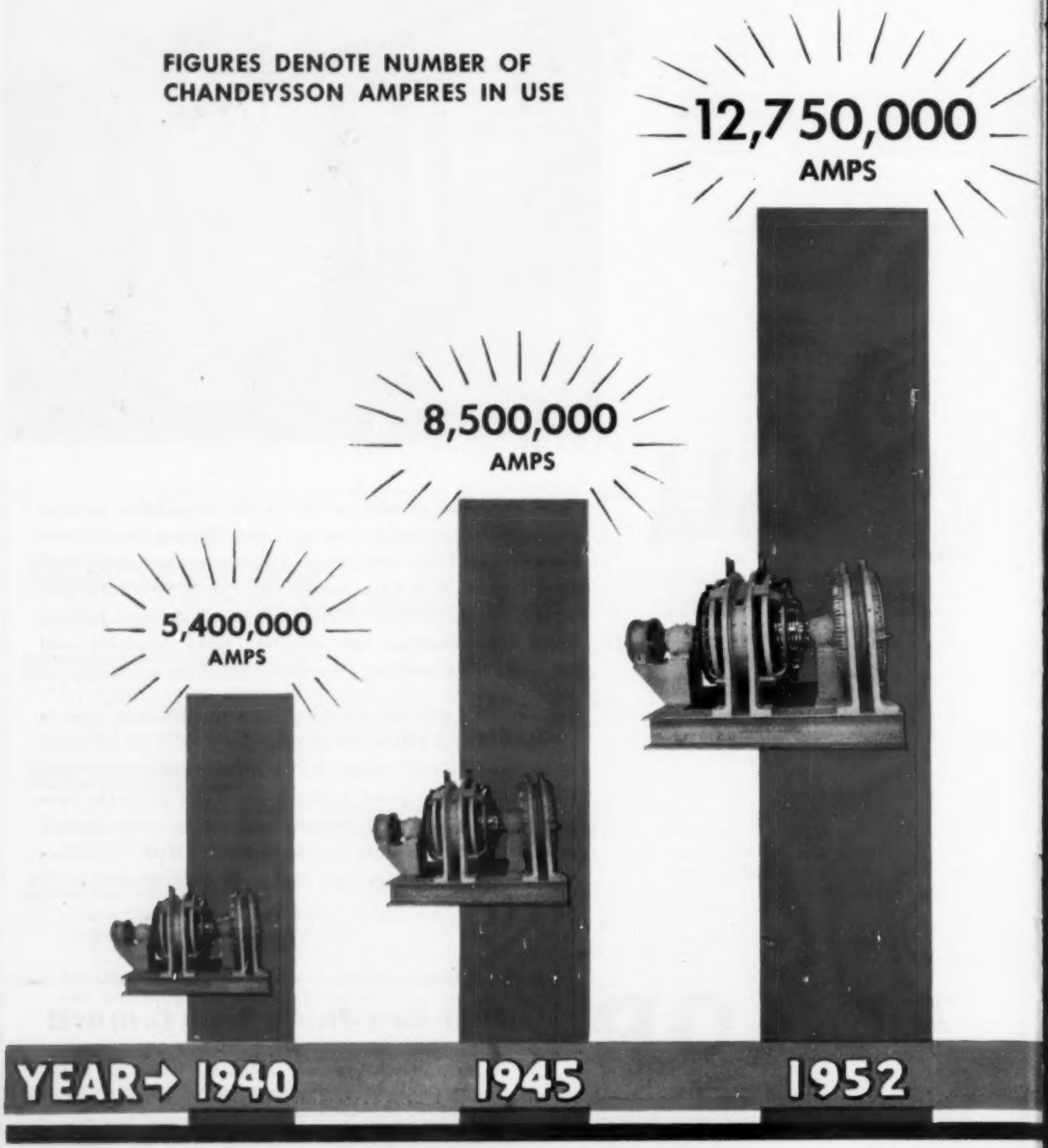
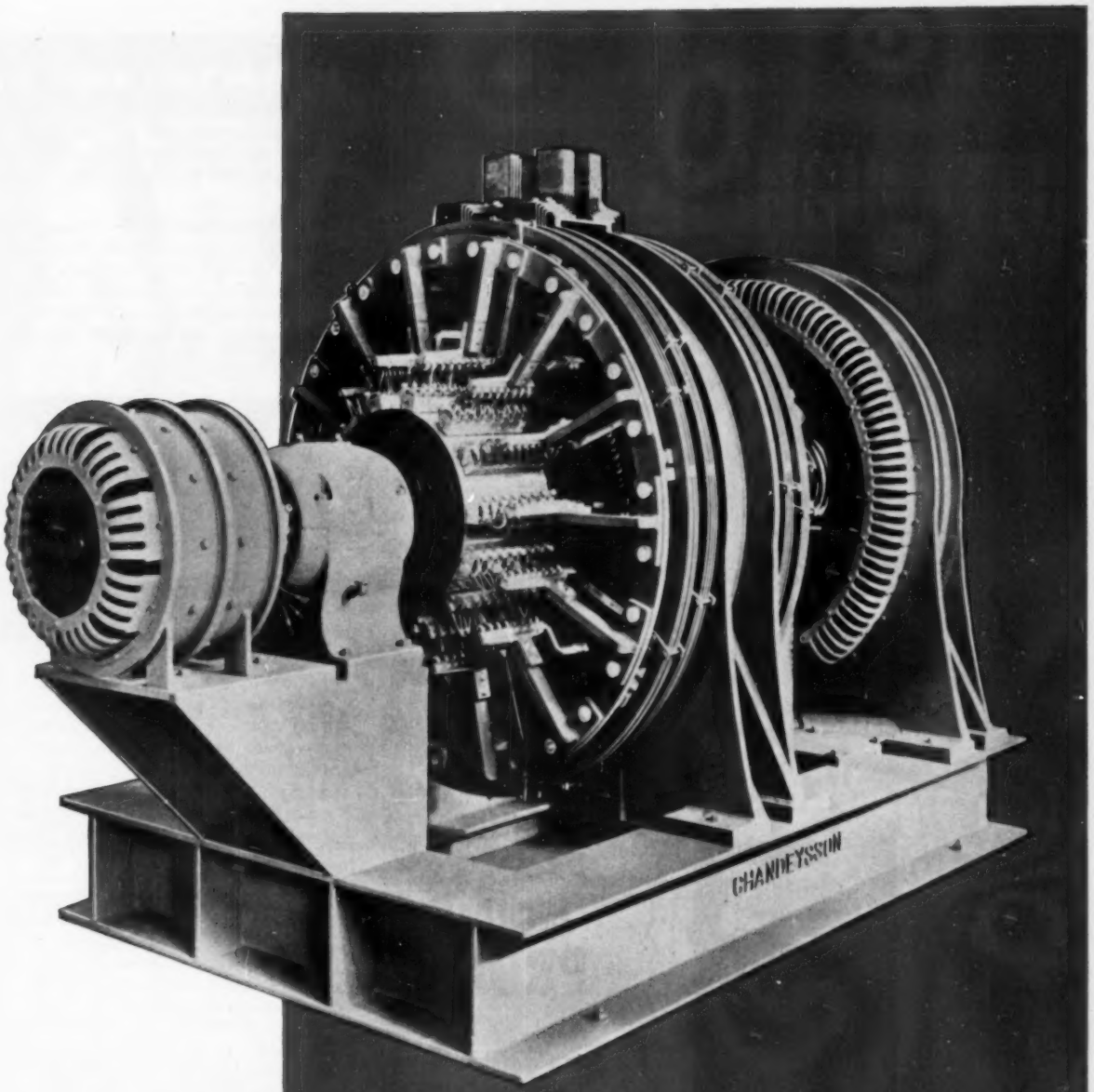
Other Alsop Plating Room Equipment

We manufacture a full line of Mixers and Agitators covering a complete range of sizes, for mixing, blending, and dissolving. Stainless Steel Mixing Tanks are also available in a wide range of capacities. For full details and illustrations write for your free catalog.

An Advertisement without words . . .



FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 644.



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FOR THE YEARS AHEAD!

write for information

Chandeysson ELECTRIC COMPANY

4084 BINGHAM AVE. • ST. LOUIS 16, MO.

Equipment and Supplies

E—625. Two New Paint Strippers—Oakite Products, Inc., have announced the development of two new paintstrippers, Oakite Compositions No. 56 and No. 57, designed respectively for tank immersion stripping and brush-on stripping of a wide variety of alkaline-resistant paints and lacquers.

Composition No. 56, the manufacturer's report, is a thin-bodied solvent, neutral in character, having a *p*H of 7. It is nonflammable, and contains no phenols, cresols, acids or alkalies. Designed for immersion stripping of urea-formaldehyde, alkyd, phenolic and urea-melamine finishes, lacquers, varnishes, wrinkle finishes and vinylite resins, the material is used at full strength and unheated, with parts to be stripped immersed for periods of time which will vary depending on the type of paint, number of coats, age, etc. Used as recommended, it is said to be safe on steel, brass, copper, zinc, magnesium and aluminum, and may also be used on wood.

Composition No. 57 is a viscous solvent intended to replace combinations of non-viscous solvent detergents and thickeners when stripping finishes from vertical and inverted surfaces of equipment. It is non-inflammable and contains no phenols, cresols, acids or alkalies. It can be applied safely on all metals at full strength by brush-on method, and is allowed to soak on surfaces until paint wrinkles or softens. Paint is then hosed or scraped off. Many phenolics, alkyds, ureas, vinyls, varnishes and lacquers are readily removed by this material, the manufacturers report, while some finishes may require more than one application.

For additional information regarding these materials use Reader Service Card.

E—626. New Carbide Tool Sharpening Method—A new method for final finishing of carbide tools—solving a major sharpening problem—is being introduced by Minnesota Mining and Manufacturing Company, and Hammond Machinery Builders.

Based on the use of low-cost abrasive paper belts and a new type belt machine, it will make possible greatly expanded use of carbide cutting tools throughout the metal-working industry.

Major significance of the new method is that it simplifies the job of carbide tool sharpening and reduces overall costs—yet produces a tool edge better than that obtained in most plants over the country today.

The new unit—designed jointly by the 3M and Hammond Companies—is known as the Carbide Belt Finisher Model 454 and is manufactured and sold by Hammond Machinery Builders.

The 4-inch by 54-inch "3M" abrasive belt used with the machine for carbide tool sharpening is made with a special hard paper backing of high tensile strength and is coated with a silicon carbide abrasive. The new belt machine can also be used for sharpening similar tools made from high speed steel and other alloys, and for other sharpening, chamfering, and surfacing operations in the machine shop. It is also designed for wet grinding operations with conventional waterproof abrasive belts.

Additional information and technical details can be obtained by using Reader Service Card.

E—627. Corrosion Resistant Tanks—Corrosion resistant tanks, fabricated throughout from Agilide (unplasticized polyvinyl chloride) are now offered by the American Agile Corporation, P. O. Box 168, Bedford, Ohio.

Resistant to most mineral acids, alkalies, inorganic salts, and a large number of organic compounds at temperatures up

BETTER COMPOUNDS *mean* MORE PRODUCTION *and* INCREASED PROFITS

Thirty years of experience developing and furnishing Polishing and Buffing Compounds to the Automobile Industry and hundreds of allied metal working firms entitles us to solicit the opportunity of working on your polishing and buffing problems.

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C. H. McAleer, President.

DETROIT CHEMICAL SPECIALTIES, Inc.
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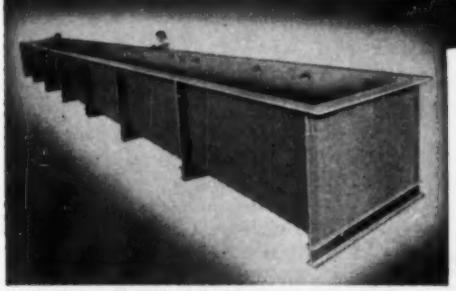
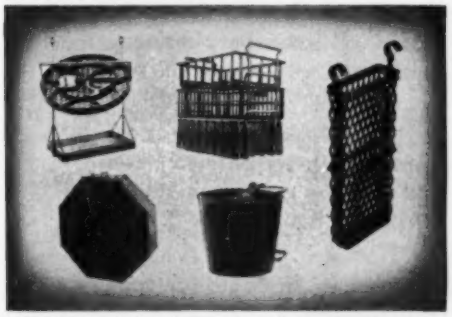
THE SYMBOL OF QUALITY AND SERVICE

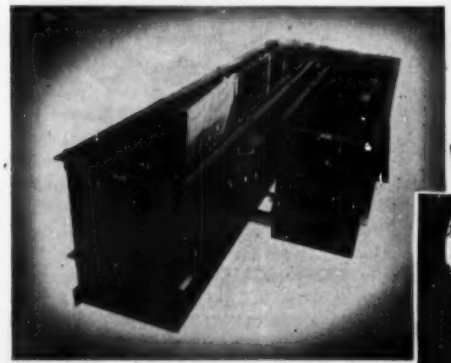
RUBBER INSULATED PLATING EQUIPMENT



ARco Sheet Rubber Lined Tanks—open or closed—any shape; any size—for all uses.



ARco Insulated Metal Baskets and Trays—protect parts, equipment and solutions.



ARco designs, fabricates and rubber insulates complete diaphragm plating tank systems.

● Regardless of the phases in your electroplating operations, ARco has the right protective rubber covering and technical services to meet your production requirements.

Sheet Rubber Lined Tanks, Insulated Baskets, Racks, numerous components and accessories, are fabricated and covered by ARco to specifications. You can consult ARco Engineers without obligation. Their recommendations can help you lower plating costs, increase production and improve work quality.

Corrosion-resistant ARco insulation may also be applied to Diaphragm Systems, Parts Separators, Air Agitation Systems, Grids and Screens, Ventilation Equipment, Pipes and Fittings, Materials Handling Equipment.

FIELD SERVICE UNITS

ARco Field Service Engineers bring complete technical know-how and facilities right into your establishment. Permanent Installations or Equipment too large to move can be fabricated and covered right on the job by ARco Field Service Units.

SEND FOR THIS VALUABLE DATA TODAY!

See the many practical, economical methods and products ARco-engineered and designed to improve your work and operations.

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ANYTHING CAN BE COVERED WITH RUBBER — BY ARco

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Change to **N-R**

SEYMOUR'S

Cold Solution Type

BARREL NICKEL BRIGHTENER

SEYMOUR'S N-R Bright Nickel for cold bath solutions saves you money and gives more uniform deposits in barrel plating of small articles. With an original addition of only 3 to 5 fluid ounces of N-R per 100 gallons of solution, a clean, even, decorative deposit of bright nickel up to .0001" can be obtained. Only 1 to 2 fluid ounces of N-R are needed per 100 gallons per load of work thereafter.

Seymour N-R cold type Brightener is simple to maintain and easy to control. Deposits are adherent to properly cleaned base metals, except zinc base direct, and may be chromium plated without prior buffing or wiping. Write for Bulletin No. 8 containing complete details.

Other Seymour Bright Nickel Processes are available for specific plating needs. Tell us your requirements.

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442 Elm St., New Haven, Conn.

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977 Niagara St., Buffalo 13, N. Y.

THE GILBERT TRAMER CO.,
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MUNNING & MUNNING, INC.,
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SMITH CHEMICAL & SUPPLY CO.,
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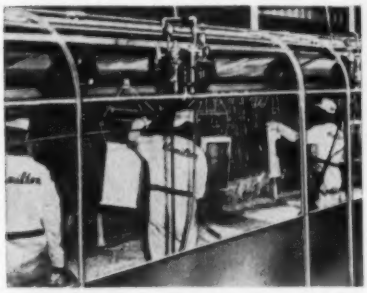
THE SEYMOUR MANUFACTURING COMPANY, SEYMOUR, CONNECTICUT

SEYMOUR

to 170° F, tanks are built to customer's specifications. For specific information on corrosion-resistance, and other particulars use Reader Service Card.

E—628. Spray Booth Maintenance Costs Reduced—Klem Chemicals, Inc., 14403 Lanson Ave., Dearborn, Mich., announces a line of water wash compounds which make the reclaiming of



paint from spray booths more practical and economical. Featured in this line is the new Klem Water Wash Compound No. 203 compounded to eliminate nightly draining of tanks. Tests show that No. 203 may be used up to 7 days before draining is required. Circulation lines, water pumps, flow control nozzles and baffles were reported free of paint sludge at the end of this period in production tests.

The principle of No. 203 is to lower the surface tension of the water, assuring complete and more uniform coverage on the water curtain and to keep the paint in a form that may be easily reclaimed. For detailed information use Reader Service Card.

E—629. Protective Coating—Pliogard, a new chemical and corrosion resistant rubber base coating and formulated with a heat-stable thermoplastic resin obtained by the copolymerization of styrene and butadiene, has been announced by Saran Protective Coatings Company, 2415 Burdette Ave., Dept. F, Ferndale 20, Mich.

This coating is finding widespread use in plating plants. It provides a durable and lasting finish for floors, walls, structural steel, tanks, ducts, process equipment and is used wherever preventive maintenance is required.

Pliogard has excellent adhesion to all clean, dry surfaces and gives good results with minimum surface preparation. Two coats provide excellent protection against fumes, vapors and occasional spillage of acids and alkalies. It is extremely heat resistant—temperatures up to 250° F continuous, and even higher for short periods of time, can readily be accommo-

CHEMICALS ACP PROCESSES

phosphate coating chemicals

TO MAKE YOUR PRODUCT DURABLE

PAINT BONDING

"GRANODINE"® forms a zinc-iron phosphate-coating bond on sheet metal products—automobile bodies and fenders, refrigerator cabinets, etc.—for a durable, lustrous paint finish.

"LITHOFORM"® makes paint stick to galvanized iron and other zinc and cadmium surfaces.

"ALODINE",® the new ACP protective coating chemical for aluminum, anchors the paint finish and protects the metal.

RUST PROOFING

"PERMADINE",® a zinc phosphate coating chemical, forms on steel an oil-adsorptive coating which bonds rust-inhibiting oils such as "Granoleum."

"THERMOIL-GRANODINE"® a manganese-iron phosphate coating chemical, forms on steel a dense crystalline coating which, when oiled or painted, inhibits corrosion.

PROTECTION FOR FRICTION SURFACES

The oiled "THERMOIL-GRANODINE" coating on pistons, piston rings, cranks, camshafts and other rubbing parts, allows safe break-in operation, eliminates metal-to-metal contact, maintains lubrication and reduces the danger of scuffing, scoring, galling, welding and tearing.

IMPROVED DRAWING AND COLD FORMING

"GRANODRAW"® forms on pickled surfaces a tightly-bound adherent, zinc-iron phosphate coating which facilitates the cold mechanical deformation of steel, improves drawing, and lengthens die life.

Send for descriptive folders and Government specifications chart on the above chemicals. Write or call for more information on these products, and advice on your own metal-working problem.

AMERICAN CHEMICAL PAINT COMPANY

General Offices: Ambler, Penna.

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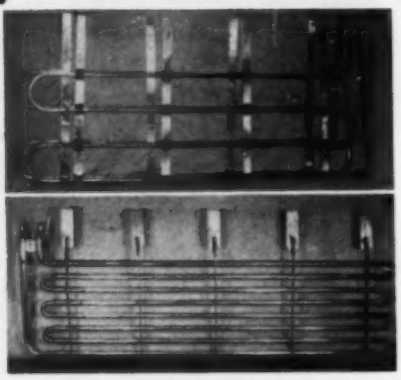
COILS by STORTS

for

HEATING
COOLING
RINSING



Coils of iron, steel, lead, brass, copper, nickel, Monel, stainless—all shapes—All sizes—Storts makes them to order and guarantees them to satisfy.

For coils that are structurally sound and dimensionally correct, you'll find that Storts is a dependable source. Further, you'll find that **STORTS** Coils provide efficient fluid flow and heat transfer, with long life utility. Be sure to get our quotation on your next requirements.

42 STONE STREET — STORTS WELDING COMPANY INCORPORATED — MERIDEN, CONN

Manufacturers of Welded Fabrications to Specification

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CrO_3 Chromic Acid

for

DECORATIVE PLATING
HARD CHROMIUM PLATE
ANODIZING ALUMINUM
CHEMICAL CONVERSION COATINGS
STRIPPING COPPER
METAL CLEANING BATHS
ORGANIC SYNTHESIS
MANUFACTURE OF CATALYSTS

The Mutual name and trade mark on a Chromic Acid drum guarantee a product with a minimum assay of 99.75% and a sulfate content not exceeding 0.1%. Chromic Acid of that purity may be used with confidence in any of the applications shown here.

SINCE 1845

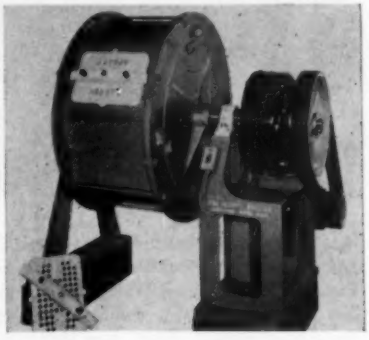
MUTUAL CHEMICAL COMPANY OF AMERICA

270 MADISON AVENUE • NEW YORK 16 N. Y.

dated. The coatings air dry quickly. They are dust-free in less than 30 minutes and can be recoated by spraying in four to six hours or by brushing in six to eight hours.

Pliogard is available in fourteen colors and also clear. A color card folder which also gives detailed application instructions can be obtained from the manufacturer upon request. Use Reader Service Card.

E—630. Improved Barrel Finishing Unit—A new tumbling barrel, designed to efficiently handle burnishing, de-burring and cutting-down operations, is announced by The Abbott Ball Company, 5 Railroad Pl., Hartford, Conn. Other outstanding features listed by the manufac-



turer include precision speed controls, interchangeable parts, low operating costs, and the use of color dynamics in the painting of the equipment. Lubrication points are bright color coded for instant identification.

The unit's improved design and the use of a highly efficient drive mechanism makes it possible to operate the barrel with a comparatively small motor.

Interchangeability of parts adds versatility and economy to the new units which are made in four standard sizes and are available in ten basic combinations with single, double and triple compartments to fit the user's requirements. Complete information, prices and literature are available. Use Reader Service Card.

E—631. Remote Signal Units—A new Panalarm adapter unit, which permits remotely located visual trouble signals to operate as part of a common, plant-wide audiovisual annunciator system, has been announced by Panalarm Products, Inc., 6312P N. Broadway, Chicago 40, Ill.

For the remote visual signals, either individual back-lighted, illuminated nameplate units or bullseye lamps are furnished. They may be used for scattered locations on panelboards or operating locations in the plant. Bullseye lamps may also be used with separate ON-OFF lights to form a three-light control station. All signals connect to a common horn or bell

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 650.

Cleaning Specialists

Anyone can do a cleaning job that *looks* good but a Northwest Chemical cleaning operation brings 'em REALLY CLEAN—gets at those tough-to-crack, invisible trouble makers that turn up on final inspection as costly rejects.

We at Northwest take a personal interest in your cleaning problems. Our thoroughly experienced staff of chemical technicians will be pleased to help you solve your cleaning difficulties. Their broad experience may save you time and money with a simple formula adjustment or a complete new processing to fit your exact requirements.

No job is too small for our attention nor too large for our abilities.

Got a problem? Let our cleaning experts help you!

NORTHWEST CHEMICAL CO.

9310 ROSELAWN DETROIT 4, MICH.

pioneers in pH cleaning control *serving you since* '32

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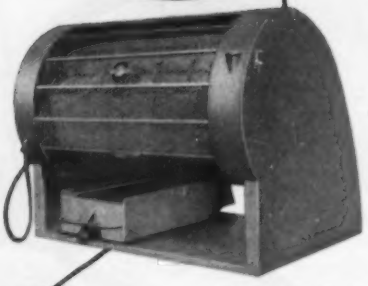
Come to TUMBLE GRAV-I-FLO FINISH for ALL your tumbling needs!

You can get complete equipment and supplies for faster, better tumbling at Grav-i-Flo. This authoritative tumbling source can furnish you, from its years of experience, the correct answer to any tumbling problem.

Larger capacity machines take 31% to 80% more work-load in same floor space. Improved cutting materials shorten cutting cycle by 15% to 25%. Grav-i-Flo installations substantially reduce capital investment, floor space, and production time!

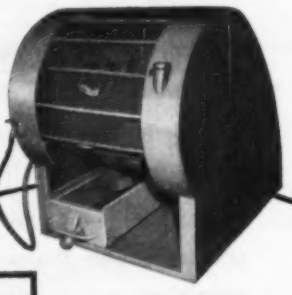


Model 66", two compartments

MACHINES

Model 48", two compartments

Grav-i-Flo 66", 48" and 36" machines have cam locked doors with manually released safety stops; available with unlined or rubber lined cylinders, constant or variable speed drive, J.I.C. controls, and timers from 5 minute to 20 hour cycles. Equipped with electric wiring and water piping installed ready for plant hook up.



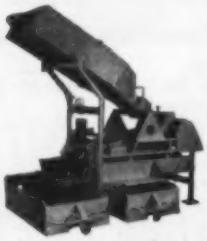
Model 36", two compartments

Model 24", two compartments

Designed For Small Lot Production and Laboratory Processing.

ACCESSORIES

Two deck parts-and-chips separator and chip grader



Occupies less floor space. Separates parts quickly without impingements. Grades 3 sizes of chips simultaneously.

Other Grav-i-Flo accessories include tubular yoke hoist pans, chip pans, wash-out doors, screens, chip bins, unloading boots, dip tanks.

Chips and compounds

Grav-i-Flo natural and synthetic deburring and finishing chips and highly developed compounds consistently outperform every type of tumbling process offered on the market.

Investigate!

Grav-i-Flo superiority in equipment and supplies has been proved to hundreds of users in many different industries. Let us show you, too, at no obligation. Our representative will visit your plant, or send samples direct to us. Engineering Service available to all users.

SEND FOR CATALOG showing complete line of Grav-i-Flo equipment, accessories and supplies.

THE GRAV-I-FLO CORPORATION

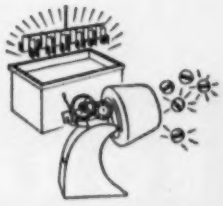
Dept. P-6 400 Norwood Avenue
STURGIS, MICHIGAN

Here are 5 NEW products for MORE PROFITABLE FINISHING

QUICK PIK—QUICK PIK is a dry acid which, when mixed with water and used at room temperature, will quickly remove scale and rust. QUICK PIK is safer to use because of its availability in a dry form. A pickling inhibitor is incorporated in QUICK PIK so as to minimize attack on the base metal during the pickling cycle.

★

MAGIC DRY—Your answer to trouble-free plating by eliminating staining, dullness and rusting. In plating, MAGIC DRY is used in the rinse cycle to help maintain the bright finish of the plated work. When MAGIC DRY is applied to tumbled parts, the bright finish is retained, thereby preventing rusting or staining.



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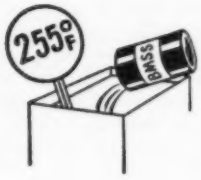
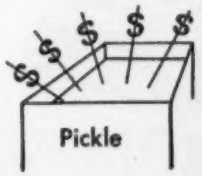


BLACK MAGIC FOR STAINLESS STEEL—A one-bath, one-salt, low-temperature blackening bath which provides an adherent black finish on stainless steel, cast and malleable iron and carbon steels. The increased use of stainless steel in production has made this product of major importance.

★

BLACK MAGIC PIK AIDE—Here is an addition agent which will assure a uniform and economical pickling operation by lowering the surface tension of your acid. This results in a cleaner, faster and smoother pickling operation as well as a reduction of acid consumption from a quicker drain-off period.



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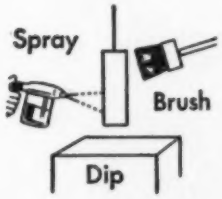

WITCH DIP #2—Here is what we believe is the most revolutionary finish ever applied over a plated or black-oxide finish. WITCH DIP #2 is a wax which dries hard, producing a lustrous, durable and highly corrosion-resistant finish. WITCH DIP #2 is available in a Gloss, Semi-Gloss or Dull finish.

Technical bulletins describing the merits of each of each of these products are available. Laboratory samples will be furnished on any of the above upon request.

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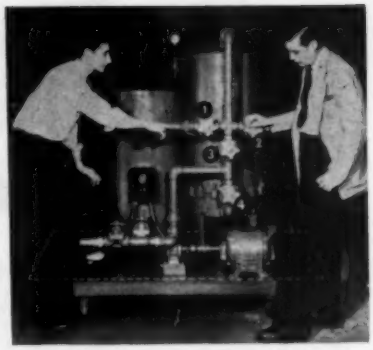
Equipment and Supplies

which must be acknowledged by the operator when an "off-normal" condition develops. For further information use Reader Service Card.

E—632. Armor Reinforced Plastic Pipe—Atlas Mineral Products Company announces the availability of Plastaloy-armored Ampcolite pipe. This new patented process permits the use of thermoplastic pipe at higher temperatures and pressures than is normally considered safe. The armored pipe is avilable in sizes up to 6 inch O.D. Armoring can be performed before or after installation. This welding of thermoplastic and thermosetting pipe yields a unit which is satisfactory for most corrosive solutions at temperatures up to 195° F. For additional information use Reader Service Card.

E—633. Redesigned Filters Save Space—Titeflex, Inc., 500 Frelinghuysen Ave., Newark 5, N. J., announces that the line of Titeflex filters has been redesigned so as to reduce to a considerable extent the amount of floor space required. As an example, the filter illustrated, Model IA-18-20) is 4 feet long by 3 feet wide, as compared to 5 feet 10 inches by 2 feet 9 inches for the model which it replaces—or 12 square feet compared to 16 square feet. In larger models the savings in space are even more significant. The reduction in floor space requirements is all-important in installations where the area available for filtration is limited.



One of the new line of redesigned Titeflex filters showing savings in floor space and convenient location of valves, motors and pumps. Dotted lines show space required by former filter of same capacity (3000 gph). Control valves numbered are: (1) recirculation valve, (2) inlet valve, (3) backwash valve, (4) inlet valve

Improvements have also been made in the location of control valves and of motor and pump.

Operation of Titeflex filters is carried out by turning a few valves, greatly reducing man hours required to operate filtration equipment. No bags, sheets or pads are needed. Standard models are available with capacity on water from 300 to 10,000 gpm, and specially designed larger filters can be built to customer's requirements. For additional details use Reader Service Card.

E—634. Degreasing and Drying Agent—A new finely ground cellulose fibre material with exceptionally high absorbency, called Cottentex, is now available for use

in degreasing and drying operations employing tumbling mills. Absorbing more than 8 times its own weight, Cottentex does a fast, thorough job of absorbing oils, grease or any liquid from metals, plastics or any type of composition. It is particularly adapted for cleaning and degreasing ball, roller and needle bearings and any other parts which can be processed in a tumbling mill. Cottentex is light in

A FEW OF THE MANY
FORMAX
PRODUCTS

STYLE C-20
CONTACT WHEELS
and F-26 Belt Lubricant

A C-20 flexible Contact Wheel will form itself to the shape of the work and permit the abrasive felt to polish contoured surfaces and F-26 Abrasive Belt Lubricant will increase belt life by preventing loading and glazing. Produces finer, smoother and brighter surfaces through lubrication.

ZIPPO BUFFS

These famous long-wearing buffs run cool under all buffing conditions. Constructed of high count bias-cut cloth or sisal mounted on safe steel centers. Available in a wide range of densities and center diameters.

A complete line of buffing compounds in bar form as well as in liquid form for brush or spray application. Also Flex-A-Glu polishing wheel cements.

Our Laboratory and Sales Engineering staff would welcome the opportunity to be of help in solving your finishing problems.

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DETROIT 7, MICHIGAN
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Sel-Rex Precious Metals for Plating

Outstanding developments by Sel-Rex in precious metals for plating have resulted in better quality at less cost for both decorative and industrial platers. Superior engineering skill and long experience in the plating field make Sel-Rex your best choice for all precious metal plating needs.

Sel-Rex **BRIGHT GOLD PROCESS** produces pore-free "mirror bright" deposits regardless of thickness. Eliminates need for scratch brushing or buffing. Gives excellent metal distribution and deposit is twice the hardness of conventional gold. Ideally suited for specification thickness in barrel or still plating.

Sel-Rex **BRIGHT RHODIUM SOLUTIONS** provide a brilliant, durable deposit that will withstand severe abrasion. The chemically stable solution is ideal for specification plating of protective coatings that will not corrode or tarnish in any atmosphere.

Sel-Rex **SILVER SOL-U-SALT** (Potassium Silver Cyanide) in pure crystalline form is completely soluble in water. Eliminates old fashioned mixing, calculating or filtering. Eliminates hazard of airborne dust—no insoluble particles in the bath to cause rough deposits.

Consult our engineers on any precious metal problem. No obligation. Detailed literature available on request.

SEL-REX PRECIOUS METALS, INC.

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Pioneers and developers of better gold, silver, nickel, copper, cadmium and rhodium salts and solutions.

Available for Immediate Shipment, Attractive Values

THE FOLLOWING EXCELLENT REBUILT AND GUARANTEED ELECTROPLATING MOTOR GENERATOR SETS AND RECTIFIERS, WITH FULL CONTROL EQUIPMENT:

PLATERS

1—7500/3750 AMPERE, 6/12 VOLT, **MUNNING** "OPTIMUS."
1—6000/3000 AMPERE, 6/12 VOLT, **BOGUE.**
1—5000/2500 AMPERE, 8/16 VOLT, **ELECTRIC PRODUCTS,** 25° C.
1—5000/2500 AMPERE, 9/18 VOLT, **COLUMBIA.**
1—5000/2500 AMPERE, 6/12 VOLT, **EAGER.**
1—5000/2500 AMPERE, 6/12 VOLT, **CHANDEYSSON,** 25° C.
1—4000/2000 AMPERE, 6/12 VOLT, **CHANDEYSSON.**
1—3000/1500 AMPERE, 6/12 VOLT, **COLUMBIA,** Synchronous.
1—2000/1000 AMPERE, 6/12 VOLT, **CHANDEYSSON.**
1—2000/1000 AMPERE, 6/12 VOLT, **MUNNING** "OPTIMUS."

ANODIZERS

1—4000 AMPERE, 40 VOLT, **CHANDEYSSON,** Exciter-in-head.
2—1000 AMPERE, 30 VOLT, **IDEAL,** Exciter-in-head.
1—1000 AMPERE, 40 VOLT, **CHANDEYSSON,** 25° C.
1—400 AMPERE, 40 VOLT, **M. G. C.,** Exciter-in-head.

RECTIFIERS

5—2000/1000 AMPERE, 6/12 VOLT, BRAND NEW **G. E.** COPPER OXIDE RECTIFIERS, for operation on 220/3/60. Special Price: $1,000.00 each.
1—2000 AMPERE, 6 VOLT, **G. E.** COPPER OXIDE RECTIFIER.
1—**GREEN SELECTOPLATER,** 1800 AMPERE, 12 VOLT.
1—**UDYLITE-MALLORY,** 1500/750 AMPERE, 6/12 VOLT.

BUFFING LATHES

3 HP, 5 HP, 7½ HP and 10 HP, **DIVINE, HAMMOND, M. G. C., GARDNER, TWIN** 5 HP and **TWIN** 7½ HP **ROME,** and other popular makes.

SPECIAL

1—**MERCIL** 12 x 12 CENTRIFUGAL DRYER, Electric Heat.
4—24" and 30" **ROBBINS & MYERS** 2-SPEED VENTILATING FANS.
2—**DIVINE & PORTER** CABLE BACK STAND IDLERS.
1—**ALMCO** DB-8 TWO-COMPARTMENT 60" x 30" HORIZONTAL TUMBLING BARREL. Unlined, with motorized shaker and unloading pan, like new (can be lined).
1—**BELKE** 32 x 29 MODEL 5-4D TWO-COMPARTMENT (EACH COMPARTMENT 16 x 29) HORIZONTAL TUMBLING BARREL. Neoprene-lined, U. S. Vari-Drive Motor.

Above is partial list only. Write to us for all your requirements for Plating, Anodizing and Metal Finishing

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Equipment and Supplies

weight, economical, fast-acting, soft and protects parts while in the tumbling process. A free sample will be sent upon request. Write to Cottentex Manufacturing Company, 403G E. Wells St., Milwaukee, Wis., or use Reader Service Card.

E—635. A New Polishing and Buffing Lathe—Hammond Machinery Builders, Inc., Kalamazoo, Mich., announce a new 10 HP Model VROW wide-swing variable speed polishing and buffing lathe, as illustrated. This new lathe has extended spindle affording maximum working area around the wheels and has a variable spindle speed range of 1500 to 3000 rpm. The speed is instantly changed by dial control while machine is running. For more information use Reader Service Card.

E—636. Plastic Coated Glove—Brand-new this year is a heavy duty plastic coated work glove that outwears regular plastic as much as 2 to 1. The new coating, called "durox", is used exclusively for Edmont Manufacturing Company's new Grappler line. It is produced by impregnating their regular plastic coating with a special compound. The result is a tough-tempered, long wearing coating that many say looks and feels a lot like leather.

In addition to its extra long wear, it has remarkable wet-grip qualities that make it outstanding for handling materials or tools that are coated with oil, grease or other slippery agents.

Four styles are available in this new Grappler line—a 12-inch fully coated gauntlet, fully coated knitwrist, palm coated knitwrist and palm coated safety cuff. For additional information write the manufacturer, 1250 Walnut St., Coshocton, Ohio or use Reader Service Card.

E—637. New Blackening Compound—A new ferrous metal blackening compound known as Dulite 3-0 Black, has been introduced by the Du-Lite Chemical Corporation, Middletown, Conn. Particularly effective for stainless steels, this compound will produce a non-fading black finish quickly and easily, on malleable iron as well, without the need for special equipment.

Now

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ANODE BAGS

For Strong Acid Solutions, Acid Copper, Acid Zinc, Low pH Bright Nickel, Fluoborates

Bags for Standard Elliptic

24" Anodes . . . . . $0.82 each
30" Anodes . . . . . $ .94 each
36" Anodes . . . . . $1.06 each
40" Anodes . . . . . $1.14 each

Nyl-Eon
ANODE BAGS

For Alkaline and Nickel Solutions

Cyanide Copper — Brite Copper
Cyanide Zinc — Brite Zinc
Watt Nickel — Brite Nickels
Silver — Tin — Brass

Bags for Standard Elliptic

24" Anodes . . . . . 63c each
30" Anodes . . . . . 72c each
36" Anodes . . . . . 80c each
40" Anodes . . . . . 88c each

Robins' all nylon anode bags made of TOUGH du Pont chemically resistant nylon offer important advantages:

☆ **TEAR RESISTANT**
3 to 4 times tensile strength and elasticity of cotton
☆ **HEAT RESISTANT**
continuous service up to 300° F.
☆ **EASILY CLEANED**
☆ **NON ABSORBENT**
☆ **CHEMICALLY RESISTANT**
Unaffected by alkalies

Prompt shipment on standard and special sizes. Write today for prices and detailed information.

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YOU GET *UNIFORM QUALITY* WITH DIAMOND CHROMIC ACID

Don't you have enough headaches that throw off the quality of your plated ware?

You don't need to suffer from variations in your chromic acid—that's one headache you can get rid of. DIAMOND controls more steps in the production of its chromic acid than any other producer. It controls more of the ingredients than any other producer.

DIAMOND's new Technical Center is ready to give you the most up-to-date service with technical problems.

This extra service—extra assurance of quality, controlled at *every* step by the one manufacturer—costs you *nothing extra*. Just make your calls to the DIAMOND sales office, or write direct to Cleveland.

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DIAMOND ALKALI CHEMICALS ®

Equipment and Supplies

The operating temperatures required for processing with Dulite 3-0 are exceptionally low, the maximum being 240° F. The compound is supplied in dry salts form which may be mixed as needed, eliminating the inconvenience and danger of carboys and liquid chemicals.

Further information may be obtained by using Reader Service Card.

E—638. Jet Blast Liquid Abrasive Blasting Machine—R. W. Renton and Company, 776 Addison Rd., Cleveland 3, Ohio have announced the availability of the new redesigned jet blast liquid abrasive blasting machine designed to clean, finish, burr, blend or etch a wide variety of dies, molds, tools and other parts. This new machine has been engineered for around-the-clock use without costly downtime for maintenance. The liquid slurry is drawn up by siphon injection and propelled from the blasting nozzle by means of a high velocity air stream. The only moving part within the cabinet is the blower which is used to ventilate the cabinet. Consequently, there are no critical wear points which necessitate frequent servicing. For additional information use Reader Service Card.

E—639. Selenium Regulators—International Rectifier Corporation, 1521 E. Grand Ave., El Segundo, Calif., has announced the development of a series of Selenium Regulators which are recommended for the regulation of relatively low d-c voltages. For example, the Type D-568 selenium regulator is recommended for the regulation of d-c voltages in the order of 1.5 volts. This unit is a regular production item consisting of two specially processed selenium plates connected in series on a mounting bracket and constitutes the basic design of a series of selenium regulators for other voltages.

Two other types of selenium regulators are currently available from production, viz., Type D-923 and Type D-1064. These units are recommended for regulation of 2.0 volts and 3.0 volts d-c respectively. Regulators for higher voltages can be produced by adding more specially processed selenium plates to the basic design. For more information use Reader Service Card.

E—640. Portable Kit Locates Metal Flaws in Field—Accurate, on-the-spot inspection for metal soundness can now be made on any metal at any location, no matter how remote, through the medium of a new, all metal, portable Dy-Chek

flaw location kit marketed by Turco Products, Inc., 6135P S. Central Ave., Los Angeles 1, Calif. The light, compact metal kit, which contains enough material to perform many field inspections, can easily be carried in one hand.

Dy-Chek materials are applied in the field in basically the same manner as they are applied in the plant. The area or part being inspected is pre-cleaned with a rag saturated with Dy-Chek dye remover, and the brilliant red liquid, Dy-Chek dye penetrant is then brushed onto the surface. Excess penetrant is removed, and Dy-Chek developer is applied by spray (two pressurized sprayers of developer are provided in each kit). The developer dries almost instantaneously, pulling the hidden red penetrant to the surface at locations where flaws exist. Cracks are indicated as brilliant red lines, while red dots indicate porosity. Depth of defects is indicated by richness and speed of bleed-back. For more information use Reader Service Card.

E—641. Expanded Metal Improves Degreasing Process—A degreasing basket, made by Stanwood Corporation, Chicago, utilizes Wheeling expanded metal to provide maximum open area and penetration of liquid or air, combined with superior strength and durability.

According to the manufacturer, the smooth diamond pattern of the expanded

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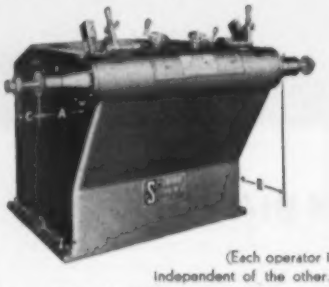
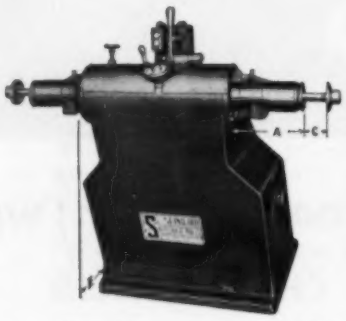
HERE'S PEAK EFFICIENCY THAT SAVES YOU TIME AND MONEY.
These machines with their "Speedial" controls give you any spindle speed from 1500 to 3000 R.P.M., Instantly! Other speeds from a minimum of 300 R.P.M. to 5000 R.P.M.



(Each operator is independent of the other.)

Type R2V. Independent Spindles Two 3 H.P., Two 5 H.P., Two 7½ H.P., and Two 10 H.P.



Type RV. 3, 5, and 7½ H.P., and 10 H.P.

Type 1BVP: 1—3 H.P. Available in Bench or Pedestal Model in 2 and 4 Ball Bearing Construction.

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30 MODELS FROM 1 H.P. TO 20 H.P.

- Maintains peripheral speed throughout wheel life.
- Gives you maximum usable wheel life.
- Lower production costs.
- Higher production.
- Also available in single or multiple speeds from ½ to 60 H.P.

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You'll save on silver plating costs...

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It's the mark that assures you of top quality, profitable silver plating because 999 "Plus" Fine means silver anodes that are—(1) always up to highest standards in fineness—(2) always free from every trace of the impurities that cause plating troubles—(3) always uniform. Next time you buy silver anodes try the Handy & Harman 999 "Plus" Fine brand and see the difference.

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Equipment and Supplies

metal prevents lodging of liquid and waste particles in corners, as sometimes happens with other materials used in basket construction. Stanwood Corporation makes baskets and trays of Wheeling expanded metal in a variety of other sizes and shapes to suit special industry needs. For additional data use Reader Service Card.

E—642. Powrite—The development of Powrite, new rust-inhibiting metal cleaning compound, has been announced by the Whitfield Chemical Company, Dept. 23-A, 14225 Schaefer Highway, Detroit 27, Mich., manufacturers of industrial metal cleaning chemicals and processes.

Powrite, it was stated, is being marketed as a multi-purpose cleaning agent—for use in mechanical power washing equipment for removing oil, dirt, chips, and abrasives from all types of metal surfaces. Other uses include: cleaning before phosphatizing; maintenance cleaning of paint; wetting out of dust and paint overspray; conditioning hard water to prevent scale or rust in mechanical washers, steam equipment, and grinders.

Dust-free, granular, and water soluble Powrite is low foaming, preventing lime scale deposition. For more information use Reader Service Card.

E—643. Soldering Flux Test Kit—Division Lead Company, 7742 W. 61st Pl., Summit, Ill., announced that it has released its first shipments of the new Divco

Soldering Flux Test Kit. The new kit has increased its number of items to 24 and includes a new Soldering Flux Chart No. 52—which describes each flux and its applications, rates it for use in soldering more than 20 metals and alloys, and gives relative solderability, solvents for residues, dielectric strengths, corrosion resistances, and all the o her facts important to attaining trouble-free and low-cost soldering. For additional information use Reader Service Card.

E—644. Expanded Aluminum Mesh—A new form of aluminum mesh, Expamet expanded aluminum, has been introduced into the United States by British Industries Corporation, 164P Duane St., New York 13, N. Y.

Manufactured in England, it has been responsible for the decorative effect on Britain's finest loudspeakers and radios. To this date, no cloth or metal substitutes have been offered in the United States which can match the sturdiness, colorful sheen and non-resonating character of Expamet expanded aluminum.

The material is made in a variety of brilliant metallic and opalescent colors, and is characterized by diamond-shaped and other special meshes of particular perfection in regularity and finish. It is light in weight, and will not rust; it can be dyed and anodized in a wide range of beautiful colors which will not peel, chip or flake and will withstand corrosive attack by most acids. The material is furnished in twelve colors including Pastel Green, Pastel Blue, Gold, Copper, Silver, Red, Dark Blue, Dark Green, Black, Florentine Bronze and Coinage Bronze. It is also available unanodized, for plants who have anodizing facilities. Expamet expanded aluminum serves a valuable purpose in other industrial applications such as machinery guards, tree guards, window guards, fire screens, open-work

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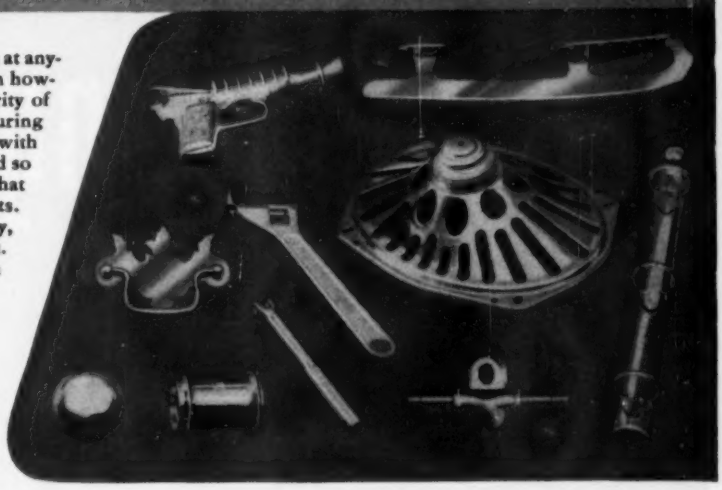

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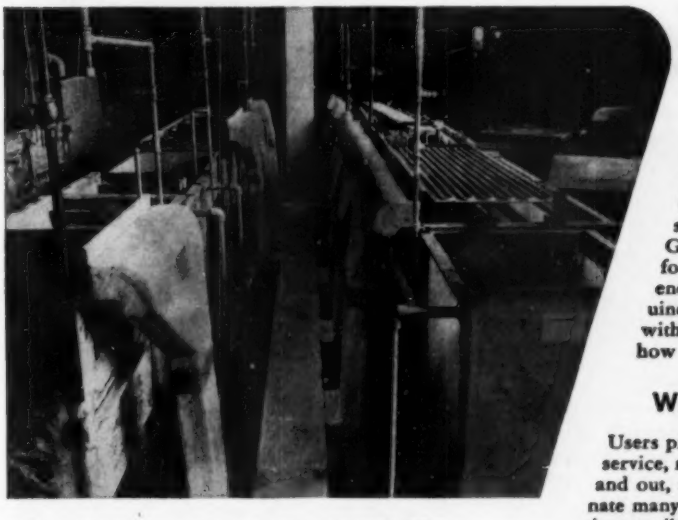

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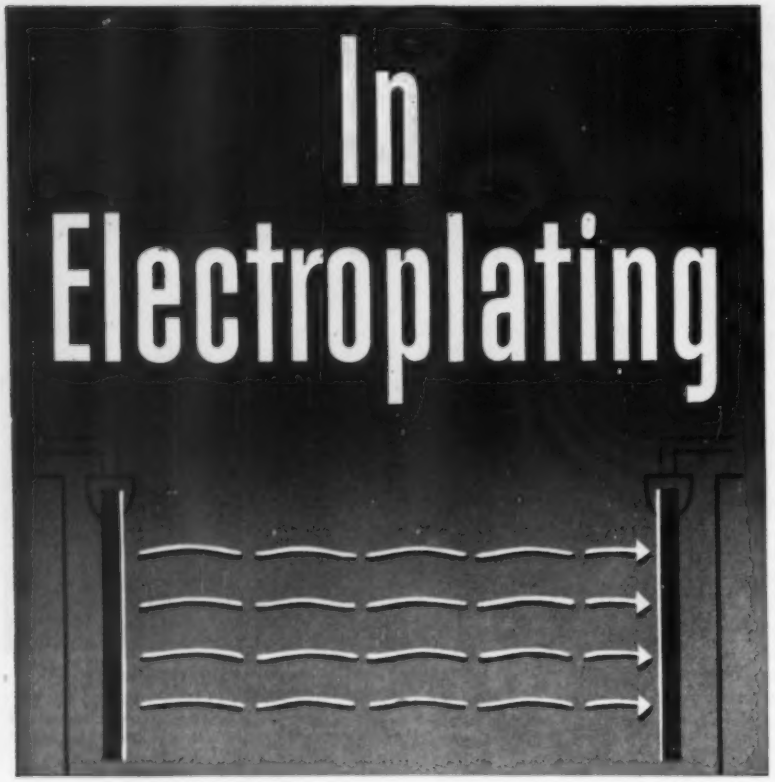

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E—645. All-Purpose Black Light Inspection Unit—A new, high-intensity, long wave Mineralight designed for use as a portable black light inspection lamp in scientific laboratories, and for industrial inspection, has been announced by Ultra-Violet Products, Inc., of 145 Pasadena Ave., South Pasadena, Calif. This Model B-50-H Mineralight is an intense 100-watt long wave ultra-violet hand lamp operating on 110-volt a-c current that throws a powerful directional beam of long wave (3660 Å) ultra-violet up to 30 feet away.

It is useful in combination with invisible fluorescent inks, dyes, or powders, for valuable industrial or laboratory inspection operations, for the determination of flaws, and for the detection of improper coverage of protective coatings. For more information use Reader Service Card.

E—646. Aro Air Hoist—A new air hoist, weighing 27½ lb with capacity to lift 1000 lb loads at 40 ft per minute, is announced by the Aro Equipment Corporation, Bryan, Ohio. The hoist is a roller chain type, powered by rotary vane air motor.

Because of numerous operating advantages, the hoist is suited for a wide range of applications such as loading and unloading on shipping docks in heat treating plants and departments, chemical plants and plating departments, in machine shops and foundries, and in automobile and appliance assembly lines.

Operating at its rated capacity of lifting 1000 lb at 40 ft per minute, the Aro Hoist does the job nearly 2½ times faster than other comparable air or electric hoists—according to the manufacturer. For further information use Reader Service Card.

E—647. Precision Balance Features Micrometer Poise—The Ohaus Scale Corporation of Union, N. J., announces the addition to its line of precision products a new type balance featuring a micrometer poise. This unique poise enables the balance to be used for a range from 0.5 to 1000 grams without additional weights. The balance is equipped with 7-inch diameter stainless steel plates and etched aluminum graduated beam. The capacity is 5000 grams, sensitivity 0.5 gram. As an additional feature, the balance has an undivided tare beam of one pound capacity. In place of the flat stainless steel plates, the balance can be furnished with two 9-inch diameter nickel plated brass pans; or a seamless brass scoop 15 inches x 7½ inches x 4½ inches and stainless steel weighing platform. For more information use Reader Service Card.

E—648. New Brundage Blower-Exhauster—A new compact blower-exhauster that solves ventilating, smoke, heat and fume removal problems for industrial plants is now available from the Brundage Company, 580 N. Park St., Kalamazoo 11, Mich.

This new exhauster does not require a cabinet or complicated superstructure. It can be fastened directly to a wall, up out of the way. The angle of discharge can be adjusted to any degree. Motor, bearings and all other parts are designed for long-lived efficiency and quiet operation. For more information use Reader Service Card.

E—649. Two New Sizes Added to Barrel Line—Pangborn Corporation of Hagerstown, Md., are now able to supply 3 and 18 cubic feet capacity barrels. The two new Blastmaster Barrel sizes (3GN and 18GN) will include all of the eight exclusive construction features which have made the presently available sizes such an instant success. One of the most important of these features is the first really abrasive-tight door ever placed on the market. Another feature is a heavy rubber curtain located between the door and the area in which the blasting takes place. This curtain protects the door from flying abrasive and prevents castings from damaging the door.

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E—650. Low Cost Infra-Red Heaters—Installation costs of Corona Manufacturing Corporation (P. O. Box 669, Glendale 3, Calif.) Merco heaters have been reduced far below other types of drying equipment according to a recent announcement. For example: In an ordinary bulb oven to cover four feet of area,

six bulbs are needed; requiring six sockets and twelve connections. With Merco units no sockets, and only two connections are required. The cost of tubes is less than that of bulbs covering the same area. Maintenance costs of replacing burned-out bulbs are reduced since tubes are guaranteed for one year, and actually last many times longer. Because tubes contain no gas and operate at atmospheric pressure, they cannot explode; thus reducing fire hazards. Tubes emit merely a faint glow when in operation, a most important feature in applications involving colors which are light sensitive and tend to fade. For more information use Reader Service Card.

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Subject: Bureau of Standards

DEAR SIR:

The demand for the resignation of Dr. Allen V. Astin, Director of the Bureau of Standards, and the reason given is cause for alarm in every technical society in this country. Secretary of Commerce Weeks is apparently completely ignorant of the duties of the Bureau of Standards and had been greatly misled and ill advised. During the past twenty-three years, as a member of the Baltimore-Washington Branch, A. E. S., I have been closely associated with many members of the Bureau staff and have always understood that the Bureau does not test products for any manufacturer, but only at the request of other departments of the Government.

The charge of bias strikes Dr. Astin only indirectly because he is the head of the Bureau and must accept the responsibility for all its actions. The full force of this accusation falls on all the employees of the Bureau. A more effective method of destroying the usefulness of the Bureau could not be devised by man. I refuse to believe this was intentional, but the result is the same.

It must be admitted that the administration is facing great difficulty in placing men loyal to its program in key positions and that such replacements are of vital necessity to the efficient operation of our government. Where, however, does the Bureau of Standards fit into any change of policy? Do units of weight and measure change when a new party is elected? Should Federal specifications be changed to fit the party line? Will aluminum now deposit from aqueous solutions under a Republican administration?

The problem of restoring the Bureau to the position it has held for years will be difficult but must be done. Nothing less than a complete public investigation of all activities of the Bureau by a group of competent scientists will suffice. A half-hearted investigation that whitewashes the Bureau, the Secretary of Commerce, or both, will not restore public confidence.

It is my considered opinion that the American Electroplaters' Society should demand a full investigation of this case and request that it be permitted to name one member of the investigation committee.

ARTHUR G. PIERDON

Subject: A Reply to Pinkerton's Paper on Rinsing

DEAR SIR:

I have read with considerable interest Mr. Pinkerton's paper on rinsing and would like to cite several points it brings up which, though academic in nature, merit discussion.

At the outset I should like to categorically assure those interested that they can safely use my approximate equations 2 and 16[1] and even the more simple approximation to be found in the Platers' Guidebook[2], in connection with all rinsing and water flow problems, provided they are used within the limits of the assumptions made in deriving them. They are satisfactory when used within these limits and do not give "impossible" results. Furthermore, the master equation on page 801[3] which is in itself only a first approximation to the truth will never give impossible results and it is on the basis of experimental data, the most accurate equation proposed to date.

The first point raised is that in the two approximations, as Q, the flow rate approaches zero, the equilibrium concentration in the rinse tank becomes impossibly large. The second point raised is a restatement of the first one so that both will be answered in the same way:

The two approximations were derived on the assumptions that first, the dragout volume per unit time would be of a smaller order of magnitude than the volume of the rinse tank, that is δ/V is negligible as compared to unity and second, that the dragout volume per unit time is of a smaller order of

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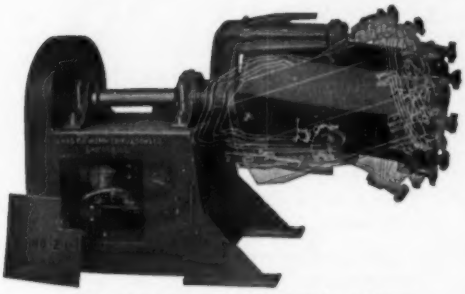

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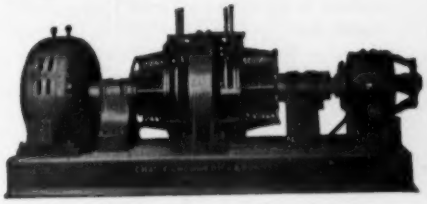

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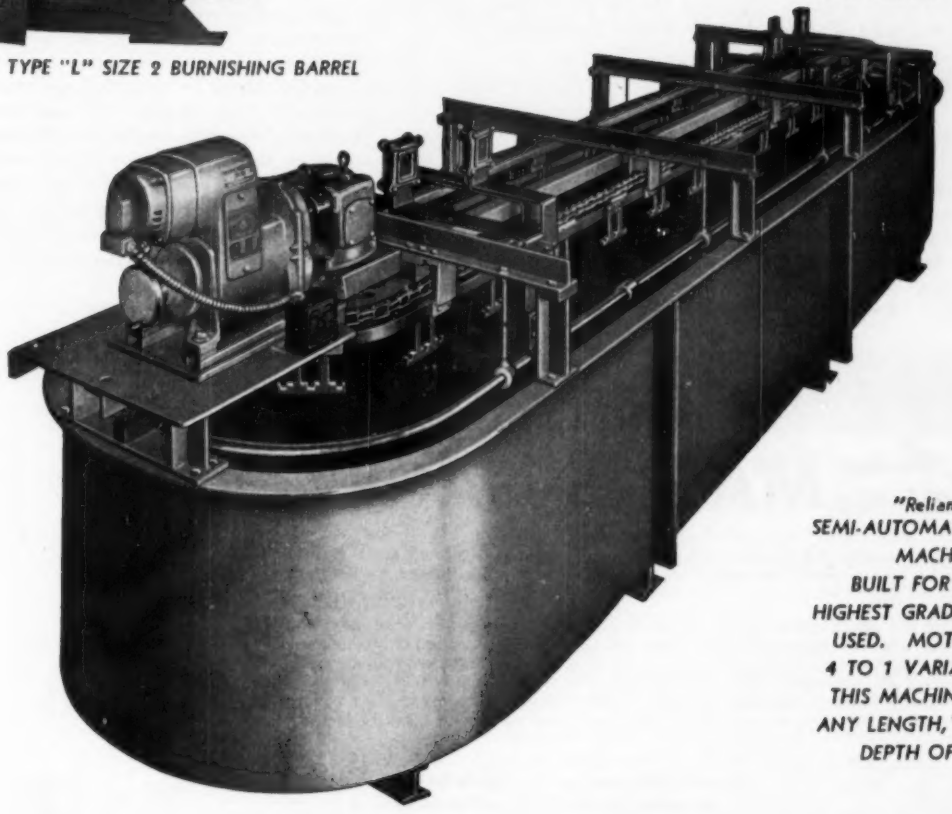

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magnitude than the total flow of rinse water in the same unit time, MQ, to use Pinkerton's notation. Equation 2 was derived from equation 16 on the basis of the assumption that the total volume of rinse water flowing per unit time is smaller in magnitude than the volume of the rinse tank. In other words, if the dragout volume is small as compared to the rinse water flow, say one-tenth of it or less, equation 16 can be used. If in addition, the flow is one-tenth or less of the rinse tank volume, equation 2 may be used as well. Incidentally, this No. 2 equation should be stated, in terms of Pinkerton's symbols as

$$C_e = C_o\,\delta\left[\frac{V - MQ}{VMQ}\right]$$

To get down to the real point of the paper, the simple, idealized equilibrium diagram (Fig. 1) makes clear what the figurative shootin' is all about. My equations give the height of the triangle bases as the equilibrium value (Pinkerton's C_{min}) whereas he claims the height of the triangle point (his C_{max}) as the equilibrium value, an average struck between his choice and mine. It is my contention that the height of the base line is the closest approximation to the true equilibrium value to date and I will prove this with the only actual published experimental figures presently available, which can be used to make such a test. A test was made by Mohler & Sternisha[4] in which an accurately controlled flow of water at a rate of one liter per minute entered a 10 liter rinse tank to which additions were made at one minute intervals of 10 ccs of salt solution with a concentration of 10,000 ppm. Let us use these data to compare theoretical to actual results:

Using Pinkerton's C_{max} formula 1,

$$C_{max} = \frac{\delta\, C_o}{V(1 - e^{-QM/V}) + \delta}$$

the equilibrium concentration turns out to be 104 ppm.

Using the simplest design equation from the Platers' Guidebook[3],

$$C_e = \frac{\delta\, C_o}{MQ}$$

C_e turns out to be 100 ppm.

Using Pinkerton's compromise value based on an average or the standard material balance method

$$C_{max} = \frac{\delta\, C_o}{QM + \delta}$$

C_e turns out to be 99 ppm.

Using my original No. 16 equation,

$$C_e = \frac{C_o\,\delta\, e^{-MQ/V}}{V\,(1 - e^{-MQ/V})}$$

C_e turns out to be 95 ppm.

Using the No. 2 equation,

$$C_e = C_o\,\delta\left[\frac{V - MQ}{VMQ}\right]$$

C_e turns out to be 90 ppm.

The test conducted indicated that the actual equilibrium value was 75 ppm. This, unless contradicted by further experimental evidence, I submit, is proof that the base line value first derived by this writer is the better approximation to the truth.

The really important question which deserves an answer is why is the true equilibrium value so much lower than the value calculated by theoretical methods? Mohler & Sternisha state, "Although the reason is not clear, the results indicate that the salt additions are carried away before they have a chance to mix with the solution present". They also go on to write that with their 10 liter rinse tank the results were approximately ¼ on the

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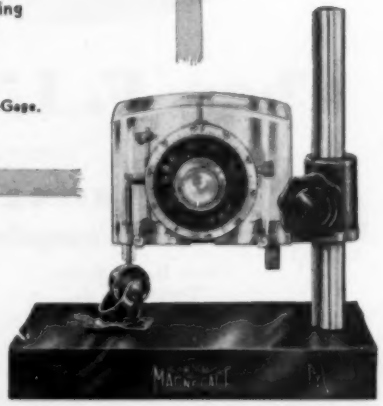

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average about 30 per cent lower or rather, that the equilibrium value obtained by them was equivalent to those in a tank with a 30 per cent higher flow rate.

It is a pity that these experimenters did not use a smaller sized tank with the same flow rate. If they had, the chances are they would have found an even lower equilibrium value. The question then arises, why should the tank size influence the height of the equilibrium curve when a materials balance shows that it does not? The answer is, of course, that the materials balance as given by Pinkerton's No. 3 equation, is not balancing all the materials! The true story is in actuality a very complex one involving Reynold's Number, laminar and turbulent flow, in which a shape and size factor make important contributions. This writer hopes to prepare a paper on this subject in the near future. In the meantime the design equations originally proposed by the writer may be safely used, as long as they are used judiciously.

REFERENCES

[1]Plating 36, 798 (1949) 915, 1130.
[2]Plater's Guidebook, 1951.
[3]Plating 36, 8, 801 (1949).
[4]Mohler & Sternisha, Metal Finishing 44, 58, 1946.

JOSEPH B. KUSHNER

Subject: Determination of Cadmium by Ferrocyanide Titration

DEAR SIR:

I am very grateful to Saubestre for calling my attention (in his letter which was published in the January issue) to the rather serious error in the factor given for cadmium which arose as he assumes, from considering that the zinc and cadmium reactions are similar. It must be admitted that on the very few occasions when the author has seen his particular method described in the literature, no reaction was given, the inference being that it was similar to that for zinc.

Regarding the "zero correction" this may be less serious than appears at first sight if the standardization of the $K_4Fe(CN)_6$ is carried out under similar conditions to the titration of the samples. The error in that case will only be appreciable if the volume of the reagent differs considerably from that taken in the standardization against metallic zinc. In the book it is suggested that for the standardization, internal indicators are employed and Saubestre is therefore correct in calling attention to the "zero correction". This correction, together with the errors inherent in all titrations with external indicators condemns the method except for routine control purposes.

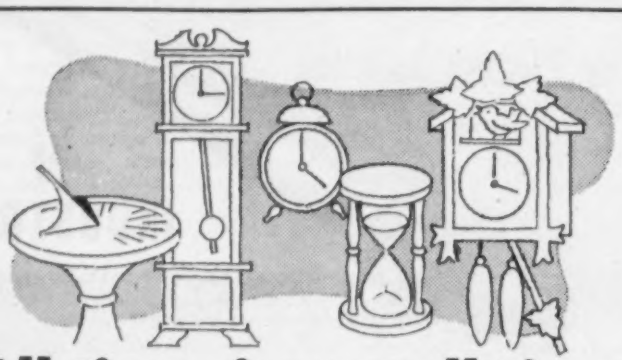
The author well remembers that at the time of writing, there was some hesitation over the inclusion of the ferrocyanide method for either zinc or cadmium, the final decision being taken on the grounds that apart from the electrolytic method (favored by the author) there were no simple and reasonably accurate methods available for the determination of either of these metals in the presence of the usual impurities associated with them in electroplating solutions.

Since reading Saubestre's letter it has been decided to attempt to apply the electrometric end point to this particular titration; this would eliminate both the "zero correction" and the difficulties in using external indicators. It would also serve to establish the true value of the Zn-Cd factor.

It does appear from the first two references quoted by Saubestre, dated 1900 and 1913, respectively, that this method for cadmium has fallen into disuse probably due to its limited application in the presence of other metals. It would be interesting to hear if any recent work has been done on this reaction.

I am greatly indebted to Saubestre for offering this most constructive criticism, and for taking the trouble to carry out the work necessary to produce the facts and figures quoted in his letter. It is only as the result of helpful suggestions of this nature that a book of this type can be kept up to date and increase in value in any future editions. Saubestre's suggestions and conclusions will certainly be acted upon if and when the author is called to revise the work.

Very truly yours,
K. E. LANGFORD



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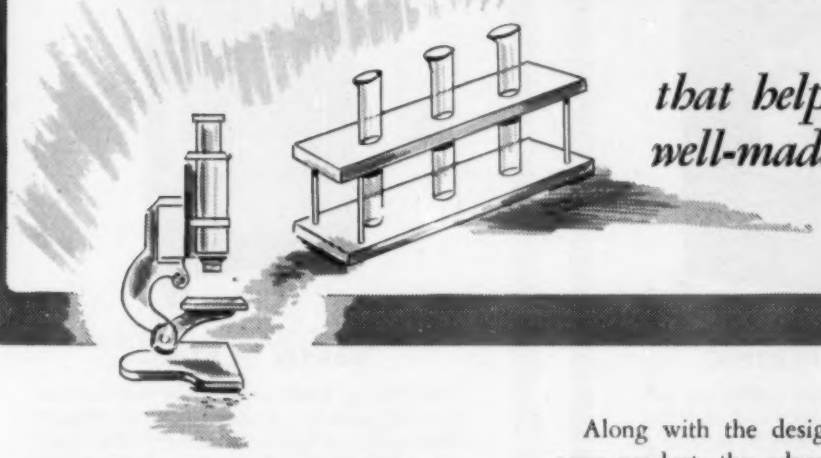

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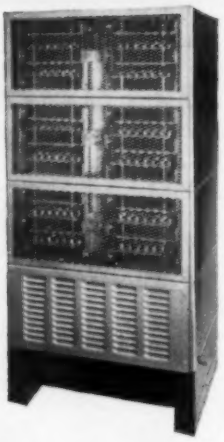

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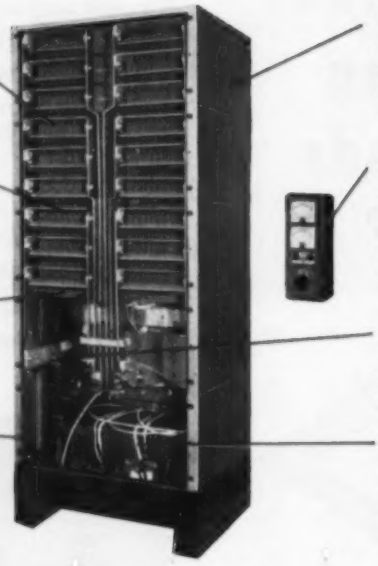

EXTERIOR FINISH. Steel parts are phosphatized, primed with hot filler, inside and out. Painted with hard, durable, acid-resistant paint which stands up under severe corrosive conditions found in electro-plating rooms. American standard No. 49 medium light grey color is used.

CONTROL STATION. Designed for wall mounting either beside the tank or power supplies, the operator's control station is provided with manually controlled and automatically regulated power supplies. It includes voltmeter, ammeter, voltage level control device, and START-STOP push buttons where specified.

BUSBARS. Heavy busbars are arranged for line-up mounting of several units. They are brought out at the rear of the casing near the bottom in floor-mounted models.

SENSITIVE CONTROL is achieved by the use of a saturable reactor to control output without the use of any resistors. It is employed on manually and automatically regulated power systems. Latest developments in magnetic amplifiers are used for regulating circuit.

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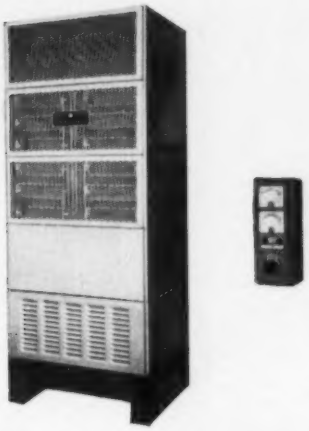

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Manually controlled power supplies consist of one or more rectifier units, all remotely controlled from an operator's control station. Can be made fully automatic at any time by adding a regulator.

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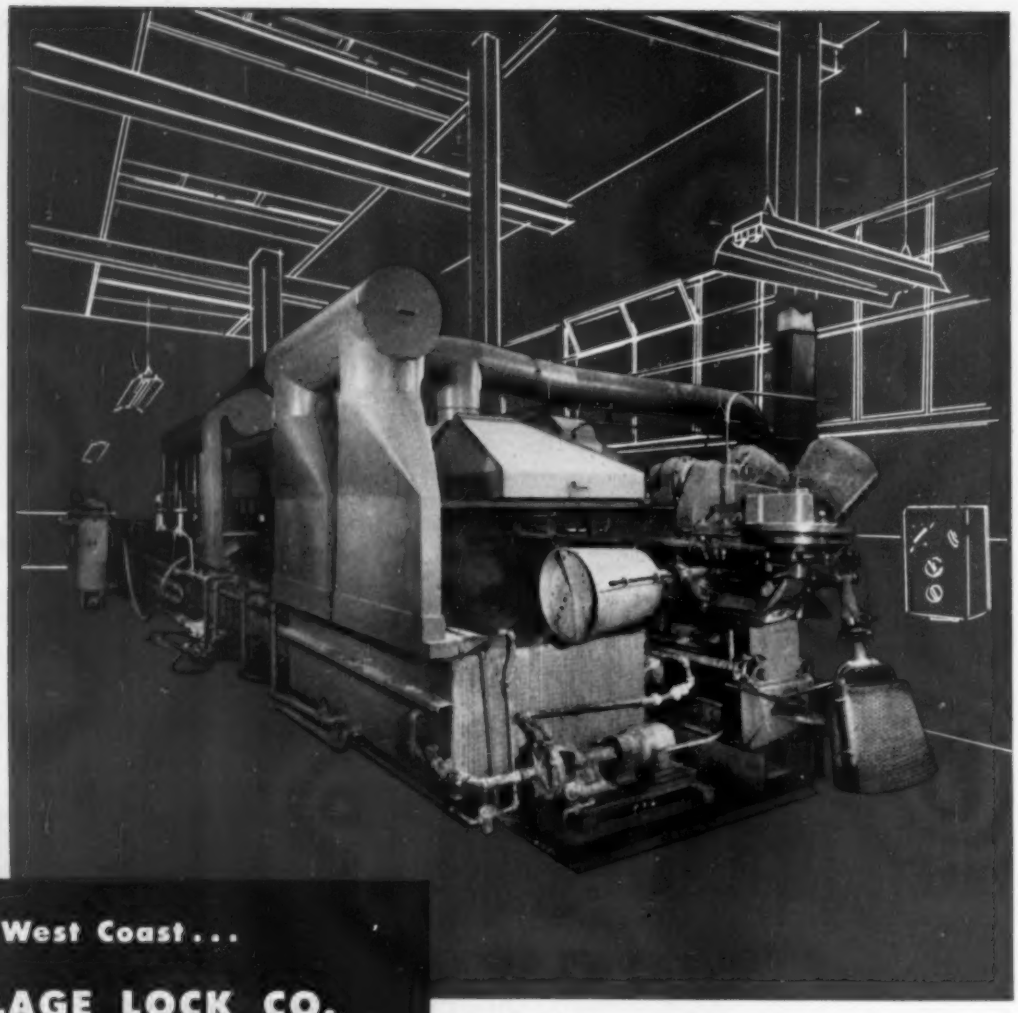

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plating

Dedicated to the improvement and dissemination of the knowledge of the arts and sciences of electroplating and of finishing of metals and of allied arts.

JUNE, 1953 VOL. 40, No. 6

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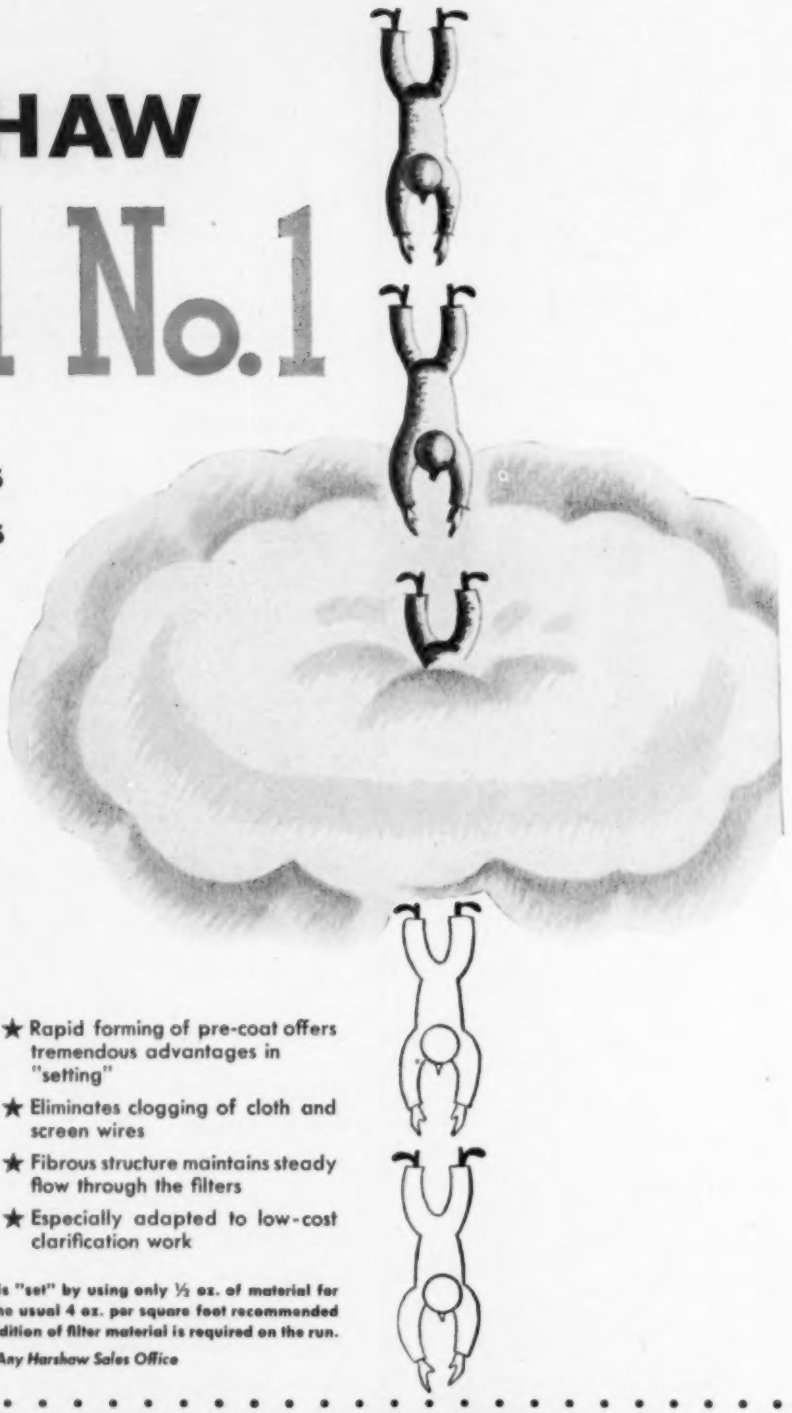

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Editorial

The Fortieth Convention

PLAYING HOST to the Society on the fortieth anniversary of the first A. E. S. Convention—fittingly—is the city whose historical significance in the affairs of this country and of the Society is unmatched.

The seedling of a flourishing Society tree was first evident in the formation, in Philadelphia, of the first branch of the National Association of Electroplaters. This group was destined to reorganization only four years later as the A. E. S. Based, in part, on its early motto—"an educational society"—it enjoyed a steady growth, weathered the economic storm of the early 30's and developed into the present group of 48 branches. In those early years, the Society's Annual Conventions were highlighted by the presentation of technical papers in educational sessions. The value of those papers in the industry at that time is quite evident from a reading of the post-presentation discussions as published in the MONTHLY REVIEW and *Proceedings*.

Members of the 1953 Convention Committee followed, as did previous groups, a time-proven pattern by the selection of topics of current interest for the technical sessions. Reproduced in this issue is the full program of events, containing a section on Abstracts of Convention Papers. A glance through those abstracts certifies their outstanding technical value. Accordingly, the alert is sounded for those whose livelihood stems from the field of industry to which the A. E. S. is devoted,—"Plan on being one of those registered at the Society's Fortieth Convention."

Al Korbelak

SOME EXPERIENCES IN PLATING ON NICKEL SILVER

GEORGE SCHORE*

Introduction

In the manufacture of metal pen parts, designers requested the use of nickel silver, and also specified a bright plated finish for added eye appeal. It was found that, although a chromium finish was adequate, a brighter looking finish was obtained by using bright nickel plus chromium or bright nickel plus rhodium. This paper has been written to outline a series of practical and technical considerations that were followed in solving difficulties that cropped up with an especially troublesome lot of basis metal.

Normal Procedure

The firm at which the work was carried out is a fair-sized job shop in the New York area and had been successfully nickel and chromium plating nickel silver parts for some time. One of its regular production items was a part of this metal that was nickel plated, engine turned and finally chromium plated. An alternate finish on the same item was the use of a nickel plus rhodium plate followed by an engine turning operation. Plating on nickel silver was not a new problem, therefore, to the finishing department of this job shop. The following is the cleaning and plating cycle which was used with good results on such parts.

1. Mild type soak cleaner (optional and used when required)
2. Water rinse (optional).
3. Electrocleaner. Cathodic in a mild composition for 30 to 60 seconds at 6 volts and a temperature of 180° F
4. Water rinse
5. Anodic etch in 15 per cent (by weight) sulfuric acid solution at room temperature for 15 to 30 seconds at 6 volts
6. Water rinse
7. Proprietary bright nickel plate at 30 amperes per square foot for 4 to 5 minutes at a *p*H between 4.0 and 4.5 (colorimetric).
8. Water rinse and dry, or
9. Proprietary chromium plate (2 minutes), or
10. Rhodium plate (2 minutes) in a sulfate solution

This cycle was operated successfully over an extensive run of parts with practically no trouble. It was used on pen parts (see Fig. 1) with one modification, and that to avoid possible etching of the highly polished finish. The modification was the substitution of a 5 per cent sulfuric acid immersion step for the anodic sulfuric etch. Several thousands of these articles were successfully processed using the immersion dip modified cycle outlined above. The customer's approval of the plate quality attested to the kind of performance effected through use of the cycle.

Revised Procedure

When the next shipment of material came in for plating, difficulties arose, and the sequence of operations used so successfully above just did not give the anticipated results. A more exact description of the part will give a better idea of the customer requirements on this deep drawn cap. It was perfectly smooth, without any lines or design marks, and the customer specified that there was to be no "orange-peel", pitting or roughness. The caps were to be covered with chromium over their entire outer surface. After plating, a vent hole was to be pierced into the item. Strict adherence to the specifications was to be assured by a 100 per cent inspection of all parts.

At first, when some of the new lot was processed, results looked favorable. Inspection during the run was provided, as specified, for coverage of chromium, peeling, roughness and color. Inspectors also hammered down each fiftieth cap and checked for blistering and adhesion as affected by the test. Through all these tests the results appeared to be all right. Not until the customer pierced the vent hole into the caps did any sign of trouble show up. A 25 per cent rejection rate was found at this step, apparently caused by the ripping of the plated layer around the vent hole. All the more baffling in this situation was that the remainder, or 75 per cent, of the caps were not affected

*Technical Sales Representative, Frederick Gumm Chemical Company, Kearny, N. J.

by the piercing operation. In an effort to get top adherence, it was decided to activate the nickel silver.

Activation Steps

Sulfuric acid solutions in concentrations varying from 5 to 50 per cent were tried with both anodic and cathodic treatments. These steps all helped in improving the adhesion, but rejects for "orange-peel" or pin holes increased to such a high point that there was no over-all improvement in the production rate. At this point, the thought occurred to the writer, that perhaps the type of activation used on some of the bright nickel solutions prior to chromium plating would be the answer to the problem at hand. The method of activation using direct current treatment in a solution of sodium cyanide was thus attempted. Results were so encouraging on a small run of parts put through with this technique that a large production lot was processed. Tests using the hammering procedure described above were always excellent so that a 12 per cent rejection by the customer was completely baffling. Since the rejections occurred only after the piercing, no immediate solution appeared to be available. The possibility of getting around the problem by piercing initially was promptly set aside because of the difficulty of chromium plating around the hole.

Stress Reducing Steps

Fortunately, at this time, Dr. Walter R. Meyer suggested to the author that the stress in the nickel deposit was greater than the bond strength between the plated layer and the basis metal. It was, therefore, decided to lower the *p*H of the nickel bath to about 3.0 (colorimetric); adjust the current density to a maximum value between 10 and 15 amperes per square foot and to lower the plating time to about 2 minutes. With this final modification to the plating cycle put into practice, it was found that the end results were satisfactory and the problem solved. Rejects were then kept to within 3 per cent which was a figure set as allowable by the customer. The tested and production-proved cycle for the troublesome lot of work is as follows:

1. Soak cleaner (mild alkali)
2. Water rinse
3. Electrocleaner. Cathodic at 6 volts for 15 to 30 seconds in mild alkali
4. Water rinse
5. Cyanide activation (16 oz/gal solution of sodium cyanide). Room temperature for 15 to 30 seconds at 6 volts, cathodic.
6. Water rinse
7. Immersion in 5 per cent (volumetric) sulfuric acid solution for 10 seconds
8. Water rinse
9. Proprietary bright nickel plate. At a *p*H of 3.0 (colorimetric) and 15 amperes per square foot for two minutes. Bath temperature, 130°F ± 5°F

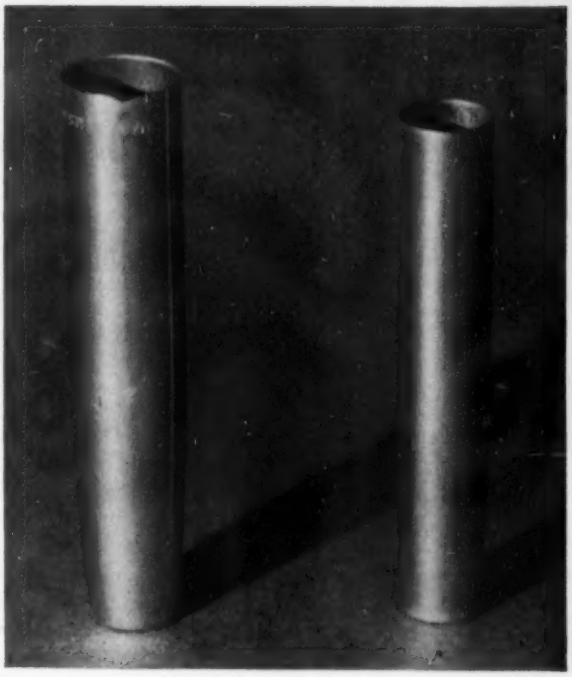

Fig. 1. View of pen and pencil caps taken after plating with bright nickel plus chromium

10. Water rinse
11. Proprietary chromium plate—2 minutes
12. Water rinse
13. Dry

Conclusions

Though the treatment cycle immediately above was found to give acceptable results in the plating of nickel plus chromium on an especially troublesome lot of nickel silver parts, it by no means will assure good results if attention is not paid to other good plating practices. The water rinsing steps are as critical in the operation as any of the other ones and it must be emphasized that adequate rinsing in good clean water must be observed. Actually, the entire cycle could have been dropped, and with it the numerous headaches that occurred, had the customer decided to go along with a finish which was just a shade different. That finish was one brought about by the use of a straight chromium plate without any underlying layer of bright nickel. But it is just these variations in finish requirements that make the job-shop operation such a nerve-racking one. It is hoped that the above-outlined lesson learned, by the writer, as to the influence of bond strength in the plating of job lots of metal parts will be of assistance to others in the field, and it is mainly for that reason that this paper was written. The cycles outlined, naturally will work in the majority of cases, but it is also apparent that circumstances may be such that results obtained from the use of the sequences will not give maximum benefits as regards adhesion.

INFLUENCE OF OPERATING VARIABLES ON COMPOSITION OF ELECTROPLATED LEAD-TIN ALLOYS

A. H. DuROSE* AND D. M. HUTCHISON*

(*Continued from May Issue*)

Accuracy and Precision

Accuracy. As described previously, two methods of determining the per cent tin in deposits were used: coulometric and gravimetric. An estimate of the accuracy and precision of the gravimetric method was obtained by the use of twenty-two synthetic samples, it being assumed that there was no error in preparing the samples. The range of per cent tin in the samples was 3 to 75 per cent. The analysis results averaged 0.08 per cent (absolute) higher than the real values and there was no definite trend with increasing tin content of the sample. However, there was a trend to lower precision as the tin content increased so that the deviation of an analyzed value from the actual per cent tin was 0.08 ± 0.0342 x per cent tin. Therefore above about 2.3 per cent tin the 0.08 value is not significantly different from zero. (See Appendix V.)

Correlation-Electrolytic vs. Gravimetric Methods. All of the per cent tin values for the dilute solution and concentrated solution were determined at least once by both the gravimetric and electrolytic methods. Using the 39 sets of values for the dilute solution and assuming the error in the gravimetric method values (x) to be small compared to the errors in the coulometric method values (y), the equation

$$Y = 0.05 + 0.981\,x$$

was obtained by the method of least squares. The precision of the y intercept 0.05 is such that the intercept is not significantly different from zero. However, the precision of the slope is such that the slope is significantly different from unity. The average ratio of y/x is 0.982. The agreement between this value and the slope 0.981 indicates also that there is no significant constant bias or error but that some error in the coulometric method increased proportionately with the per cent tin. Over the range compared (0–73 per cent tin) the correlation coefficient was 0.978 which indicates very good correlation between the two methods of analysis. (See Appendix VI.)

The data presented in the graphs were obtained by the coulometric method and to be strictly correct each value should be divided by 0.981. The data were not corrected for two reasons: (1) the coulometric method was used in replicate to obtain an average and precision, and (2) the precision did not warrant making the correction. The correction for 50 per cent tin would be about 1 per cent tin.

Reproducibility. Data on precision are all based on the coulometric method only. At the beginning of the experimental work it was falsely assumed that the precision would be the same for all solutions, all deposits and all conditions such as current density. For this reason replicate data were not taken under every condition. Duplicate or triplicate determinations were made on 20 of the 39 conditions for the dilute solution, 20 of the 39 conditions for the concentrated solution and only 3 of the 15 conditions for the intermediate solution. The precision data, therefore, do not apply to the intermediate solution.

The points representing the average of replicate determinations are indicated by circles in the curves.

The two main sources of error are: (1) the preparation of the solution, and (2) the plating step. The latter would include errors in weighing panel specimens and in current density. Repeat determinations were made on identical solutions, which would show errors in (2), but were for the most part replicates made by using two or more solutions of supposedly the same composition. The precision obtained by the latter procedure would include errors of both (1) and (2). It was shown that there was no significant difference in precision between repeats on one solution and duplicate solutions. The conclusion is that the error in preparing the solutions was negligible compared to that of the plating step. (See Appendix VII.) Nevertheless, most of the data used in obtaining precision were from replicate solutions.

Two questionable but reasonable liberties have been taken in presenting the reproducibility data which follow, and which are based on the average of two determinations although in several cases triplicate determinations were made. First, the precision cannot strictly apply to those determinations which were only made once. However, if such "questionable" points fall on a smooth curve along with other points which are the average of replicates then it is reasonable to

*The Harshaw Chemical Company, Cleveland, Ohio.

assume that the "questionable" points are better than single determinations. Second, the precision varies depending on conditions such as per cent tin in alloy and slope of the current density—per cent-tin-in-alloy curve. It probably varies somewhat also with total metal concentration, addition agent, addition agent concentration and similar variables. There is a significant difference between the precisions of the dilute and concentrated solutions. However, inspection showed that differences in slope of the C D–per cent tin curve could account for the difference in precision of the dilute and concentrated baths. (See Appendix VIII.) The precision is therefore presented as being dependent on the per cent tin in the alloy deposit (log-normal) and also on the slope of the C D—per cent tin curves. Table IV gives the ± values (L) of the mean for these conditions.

The higher L value as taken from the per cent–tin data or slope data of Table IV should apply to the individual points of the dilute and concentrated bath curves. Actually all values *did* fall within the appropriate ± limits. The reasons for these two factors, per cent tin in deposit and slope for affecting the precision is obvious. For those points representing single determinations the confidence limits would be about double those given in Table IV[7].

TABLE IV. PRECISION OF DATA—
95 PER CENT CONFIDENCE LIMITS

Per Cent Sn In Deposit	S^2	D.F.	L Per Cent
0– 5	0.09	6	0.53
5–10	0.55	11	1.16
10–25	3.3	15	2.8
25–65	3.8	13	3.0
Slope, Relative			
Low	0.9	13	1.47
Medium	1.1	19	1.58
Steep	5.8	13	3.7

APPENDIX

I. *Analytical Method—Stannous Tin*

1. Pipette or burette two 25 ml portions of standard 0.15 N iodine solution into two 500 ml glass stoppered flasks.

2. To each flask add 170 ml of water and 25 ml of 1:1 hydrochloric acid. Stopper flasks immediately.

3. To one of the flasks run in exactly 5.0 ml of the plating solution sample. If the iodine becomes decolorized, add an additional measured quantity sufficient to insure a distinct yellow color in the solution. The other flask will serve as a standard.

4. Titrate the flasks with standard 0.1 N thiosulfate solution until most of the iodine has been decolorized. Then add 5 ml of 5 per cent starch solution and proceed to the end point.

5. From the standard titration, subtract the sample titration and calculate according to the following equation:

$$\frac{(A) \times (B) \times 0.05435 \times 100 \times 1.335}{5.0 \text{ ml sample}} = \text{oz/gal stannous tin}$$

where A = ml of thiosulfate and B = normality of the thiosulfate.

II. *Analytical Method—Lead*

1. Pipette 5.0 ml of the sample into 100 ml of 5 per cent sulfuric acid. Stir well and let stand at least one hour.

2. Filter through a tared Gooch crucible and wash thoroughly with 5 per cent sulfuric acid. Follow with 50 per cent isopropyl alcohol to wash out the sulfuric acid.

3. Dry, ignite (not over 600° C), cool and weigh as $PbSO_4$. Calculate lead by the following equation:

$$\frac{(\text{grams } PbSO_4) \times 0.683 \times 100 \times 1.335}{5.0}$$

III. *Analytical Method—Tin in Lead–Tin Alloys*

1. Weigh accurately 1.0 gram of the alloy and transfer to a 150 ml beaker.

2. Add 30 ml of 1:4 nitric acid, cover the beaker, and digest on a steam bath until the lead dissolves and tin has been converted to metastannic acid.

3. Rinse, cover with a minimum of water, then evaporate the sample to dryness without the cover.

4. Add 50 ml of 5 per cent nitric acid and digest until the crystals of lead nitrate dissolve.

5. Thoroughly mix in some paper pulp and filter through a fine textured filter paper. Police the beaker and wash precipitate with 5 per cent nitric acid until washings are free from lead.

6. Slowly ash the precipitate and paper in a tared porcelain crucible and when carbon is gone, ignite strongly for several minutes.

7. Cool and weigh. Calculate the ash weight to tin:

$$SnO_2 \times 0.7877 = Sn$$

IV. *Derivation Formula for the Electrolytic Method*

W = weight of alloy in grams
A = ampere-hours used
a = fraction of lead in alloy deposit
1–a = fraction of tin in alloy deposit

then

$$\frac{aW}{103.61} = \text{gram equivalents of lead in alloy deposit}$$

$$\frac{(1-a)W}{59.35} = \text{gram equivalents of tin in alloy deposit}$$

$\frac{A}{26.8}$ = Faraday's passed or total gram equivalents deposited

$$\frac{aW}{103.01} + \frac{(1-a)W}{59.35} = \frac{A}{26.81}$$

and

$$a = 2.341 - 5.182\frac{A}{W}$$

or

$$\text{per cent tin} = \left(5.182\frac{A}{W} - 1.341\right)100$$

V. *Accuracy of Gravimetric Method*

Range of analysis per cent minus actual per cent was −0.66 to +0.75 per cent. Standard deviation varied almost directly with per cent tin (lognormal).

$\frac{s.}{\text{per cent tin}} = 0.0114$, degrees of freedom = 16,

$$n = 22,\ t_{.05} = 2.12$$

It is assumed that a *single* determination by this method will have limits of uncertainty of $\pm 3\ s'$.

VI. *Correlation—Gravimetric and Electrolytic Method*

$n = 39$

$Y = 0.05 + 0.981\ x$

$s_b = 0.00635,\ t_{calc.} = 3,\ t_{0.05} = 1.96$

$s_a = 0.23,\ t_{calc.} = 0.218,\ t_{0.05} = 1.96$

VII. *Precision—Identical and Duplicate Solutions*

Only comparable data were used (see below).

s^2 for identical solutions = 0.108 D.F. = 8

s^2 for repeat solutions = 0.16 D.F. = 15

VIII. *Precision—Variation with Concentration*

			No. Having Slopes		
	s^2	D.F.	Low	Med.	Steep
Dilute.....	0.264	24	11	13	0
Conc.....	5.6	11	0	1	10

ACKNOWLEDGMENT

The authors wish to express their appreciation to L. Gianelos for assistance in laboratory work and to the Harshaw Chemical Company for permission to publish this paper.

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Book Review

DR. HAROLD J. READ

Professor of Metallurgy, Pennsylvania State College

NONFERROUS PHYSICAL METALLURGY by Robert J. Raudebaugh, 1952, xii + 345 pages. Pitman Publishing Corporation, 2 West 45th Street, New York 36, N. Y. Price, $6.50.

A more descriptive title for this book would be "A Condensed Handbook of Nonferrous Physical Metallurgy", for the author has done an excellent job of boiling down a great deal of factual information into a comparatively small volume. There are no discussions of the fundamental concepts and theories of physical metallurgy which one would expect to find in a book bearing the title which the author has used.

Of the seven chapters, four are devoted to aluminum, magnesium, copper and nickel and to the alloys of which these elements are the major constituents. Cadmium, lead, tin and zinc and their alloys are treated in a chapter which is followed by another which disposes of the precious metals and several other less widely produced metals. The brief final chapter presents a few highlights on powder metal products and on refractory-metal composites.

Within each of these chapters the author has organized his material rather well. He has, furthermore, maintained a reasonably high degree of parallelism from one chapter to the next, that is, the individual topics are presented in the same order in each chapter. This arrangement, in conjunction with a fairly complete subject index, makes it quite easy for the reader to find a specific detail in the book.

A bibliography of useful references is appended to each chapter, and is keyed to the text, albeit with the most awkward superscripts this reviewer has ever seen. The number of entries ranges from eight for the chapter on nickel to 66 for the chapter on aluminum.

Many excellent photographs, micrographs and line drawings enhance the usefulness of this attractively printed book, and much information is presented concisely and with clarity in numerous tables and graphs. There appears to be remarkable freedom from errors of fact and typography.

In evaluating the potential usefulness of this book to metal finishers, it is necessary to emphasize that the volume is not likely to be helpful or, in the case of many passages, intelligible to a reader who is not familiar with the basic ideas and theories of metallurgy, particularly metallography. On the other hand, granted such a background, it is easy to see where the factual information in the book could well prove useful in attacking any practical problem in the nonferrous field wherein metallurgical aspects are involved.

project no. 12

project director:
HENRY B. LINFORD*

associate
EDW. B. SAUBESTRE*†

location:
COLUMBIA
UNIVERSITY,
NEW YORK CITY

Acknowledgment is due the Research Committee, Dr. W. A. Wesley, The International Nickel Company, Chairman; the Research Directing Committee, Mr. G. M. Cole, Ternstedt Division, General Motors Corporation, and Dr. Donald Price, Oakite Products, Inc., Chairman and Vice-Chairman, respectively; and the Project Committee, Mr. E. T. Candee, Lea Manufacturing Company, Chairman; Dr. W. A. LaLande, Jr., Pennsylvania Salt Manufacturing Company, and Dr. Edward Parker, Technic, Inc., for their contributions to this project.

*AUTHORS
†PRESENTLY WITH SYLVANIA ELECTRIC PRODUCTS INC., FLUSHING, N.Y.

CLEANING AND PREPARATION OF METALS FOR ELECTROPLATING

VI. SENSITIVITY OF DEGREASING EVALUATION TESTS

Continued from May issue

5. Appendices

(a) *Pipette Calibration*

The volume of carbon tetrachloride drops falling from the tip of the pipette was measured as a function of temperature, rate of flow, and position of the meniscus in the pipette. Table XIV shows the effect of temperature. It is seen that this factor is an important one. Table XV shows the effect of rate flow. Most experiments were performed in the range 400–800 sec/100 drops. It is seen that this effect is not a very important one.

Runs were made to determine the volume of ten drops in any 0.1 ml interval of the meniscus in the column, ranging from 0.4–1.0. Ten runs were made, at constant temperature and rate of flow, at each 0.1 ml interval. The t test showed no significant difference for the results obtained between any two given 0.1 ml intervals along the column.

(b) *Preparation of Surfaces and Test Solutions*

Table XVI tabulates the procedure used in preparing benzene-dried, heat tinted, and passive surfaces. See also a previous reference[10b] for further details.

Table I, previously presented, shows that five different test solutions have been used. To illustrate the procedure used, test solution E will be considered. The details are given in Table XVII. It will be noted that, generally speaking, the solutions being prepared are discarded at several stages in the process. This is done to insure that an equilibrium amoun of oil shall have been adsorbed onto the walls of the equipment so that there will no longer be any net transfer of oil between the test solution and the glass wall. The amount of adsorbed oil can be considerable. Assuming that one monolayer is taken up by the walls, Table XVIII illustrates how much oil is removed from the test solution. As a check on the validity of the method presented, test solutions were made up repeatedly from the same stock solution, without any significant change in wetting test results observed. Further, in any given run, three panels are used. The order of test solution application to these panels was, for example, D, E, C. When the curve of C.I. vs. oil concentration is later plotted then, three separate curves are obtained. In 30 cases out of 31, when these curves were plotted, they merged into one continuous curve, a further check on the validity of the method. The results obtained were also checked qualitatively with the Langmuir-Blodgett method (see Appendix (e)).

A blank run showed that if no oil is added to the weighing bottle, 50 drops of carbon tetrachloride must be applied to one of the circled areas on the panels before the first "transitional" reading is obtained with the atomizer test. As the most drops used during testing is 10 drops/circle, the effect of impurities in the carbon tetrachloride and of accidental contamination is seen not to be serious.

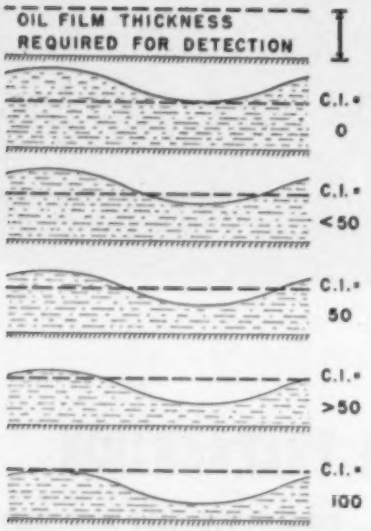

Fig. 4. Effect of Irregularities in Oil Distribution on the Water-Break Test

(c) *Laboratory Data*

For reasons of space limitations, all of the original data cannot be given. Tabulated below (Table XIX) are values of oil concentration vs. C.I. The only pairs of values given for each run are those where C.I. first exceeds 0 in value as oil concentration decreases, and those where C.I. first reaches 100. The method of interpreting these results was given briefly in an earlier section, and is given in greater detail in the following section (Appendix (d)). The value of oil concentration is obtained from the laboratory data by the following equation:

$$\text{Oil Concentration } (g/cm^2) = \frac{A}{B} \times \frac{C}{D} \times E$$

where A is oil weighed out (g); B, the volume of carbon tetrachloride (ml) used to dilute; C, the drop volume (ml); D, the test area (cm^2) of the drop; and E, the number of drops.

Table I indicates the five test solutions used, from which the first term on the right can be calculated, knowing the amount of oil weighed out. The drop volume (as a function of temperature) is given in Table XIV. The test area of the drop is 2.85 cm^2. An example of such a calculation follows:

For 6 drops of Solution D at 31° C, with 101.2 mg oil weighed out,

$$\text{Oil Concentration } (g/cm^2) = \frac{0.1012}{10{,}000} \times \frac{0.00729}{2.85} \times 6 = 15.5 \times 10^{-8}$$

Details on surface treatment may be found in Table XVI.

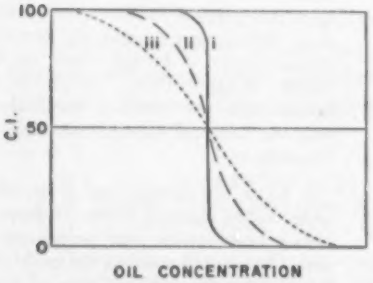

Fig. 5. Effect of Irregularities in Oil Distribution on Curves of C.I. vs. Oil Concentration

(d) *Recording of Results*

It was previously indicated that the sensitivity results reported in this paper are for C.I. = 50, determined as a log mean. Reasons for this choice will now be given.

Consider the water-break test. If the oil is deposited in a strictly uniform manner, then, for any given oil concentration, either C.I. = 0 or C.I. = 100 (i. e., either there is complete water-break, or there is none at all). However, a glance at the laboratory results presented above will indicate that as the oil concentration decreases, there is a gradual change of C.I. from 0 to 100. The presence of water-break at some points in the test area, and its absence at others, clearly implies a certain non-uniformity of distribution. In general, when the carbon tetrachloride on the panel evaporates, it deposits the oil as a series of concentric annuli, with ridges of greater oil concentration bounded on either side by areas of lower concentration. As was stated above, this effect was lessened by tilting the panel back and forth during evaporation. Fig. 4 illustrates five cases, ranging from C.I. = 0 to C.I. = 100. Consider the case where C.I. < 50. If all the "hills" were removed and used to fill the "valleys", the uniform oil layer resulting would be greater than that necessary to cause water-break, and the cleaning index would become 0. Likewise, where C.I. > 50 in Fig. 4, such levelling would bring the resultant uniform layer below the necessary thickness for water-break, and C.I. would become 100. It can be seen from this argument that the more nearly uniform the oil layer deposited, the more will the C.I. value (for any particular oil concentration) tend towards 0 if the value lies between 0 and 50, and towards 100 if the value lies between 50 and 100. Fig. 5 shows three curves which would result from having (1) uniform oil layer, (2) nearly uniform layer, and (3) wavy oil layer. It can be seen from Fig. 5 that the only common point between the three curves is C.I. = 50. This point, then, is the one which gives the "true" value of sensitivity.

It was assumed in the above discussion that the irregularity in oil layer thickness is wavy in nature. More likely, in the experiments reported here, the distribution consisted more of ridges bounded by large, flat valleys. The error resulting from this situation would be conservative, that is, the values reported for sensitivity would be slightly high in value.

While the method reported above works well for the water-break test, it is not directly applicable to the other tests. The other evaluation tests are recorded as C.I. = 0, T (transitional), or 100. Obviously, the desired point will occur in the transitional range of C.I. values. This region of values, however, generally encompasses about a 10-fold range of oil concentrations, so that, in order to determine the value of sensitivity for any given test, some arbitrary choice must be made as to which point in the transitional region to select. In line with the reasoning above for the water-break test, it would seem desirable to pick the mid-point of the transitional region. There are two ways to determine the mid-point: log mean and arithmetic mean. The latter has two advantages: (1) its use is in accord with the picture given above for the water-break test and (2) it is the more conservative of the two (for a 10-fold range of oil concentrations in the transitional region, the arithmetic mean value is twice the log mean value). However, for recording purposes here, the log mean value has

TABLE XIV. EFFECT OF TEMPERATURE ON DROP SIZE

t (° C)	V (ml)	σ	n
27	0.007588	0.000017	10
30	0.007362	0.000023	10

In equation $V = a + bt$, $a = 0.009621$, $b = -0.0000753$, V in ml, t in ° C. $L_{.95} = \pm 0.000042$

TABLE XV. EFFECT OF FLOW RATE ON DROP SIZE*

	At 27° C	At 30° C
a	0.007569	0.007349
b	0.00000003	0.00000002

*In equation $V = a + b\Theta$. V in ml, Θ in seconds/100 drops. $L_{.95} = \pm 0.000045$.

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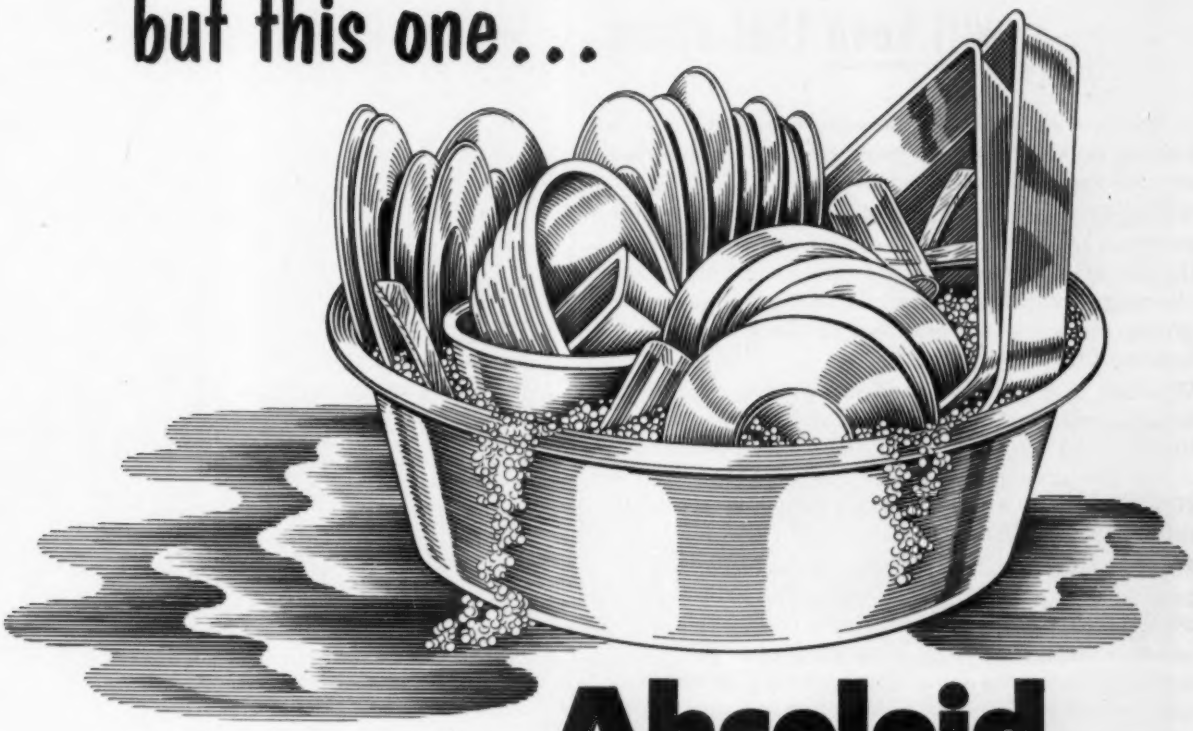

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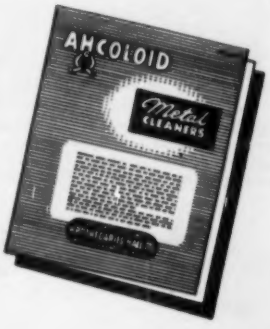

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TABLE XVI. SAMPLE PREPARATION

Step	(a) Benzene Drying	(b) Heat Tinting	(c) Passivation
1. Wash in two 25-ml portions CCl_4. Dry.	X	X	X
2. Pickle in 20 per cent HCl to disappearance of rust.	X	X	X
3. Rinse 30 sec in water	X	X	X
4. Standard cleaner[103d] for 30 min at 100° C, and standard rinses[103d].	X	X	X
5. Pickle 15 sec in 20 per cent HCl.	X	X	X
6. (a, b) Rinse 15 sec in H_2O, 1 min in CH_3OH, 1 min in C_6H_6. Dry.	X	X	
7. (b) Heat over low flame to appearance of first blue oxide.		X	
6. (c) Rinse 2½ min in H_2O.			X
7. (c) Dip 15 sec in soln. of 100 g/l K_2CrO_4 + 20 per cent HCl.			X
8. (c) Dip 15 sec in H_2O.			X
9. (c) Dip 20 min in soln. of 10 g/l NaOH + 100 g/l K_2CrO_4.			X
10. (c) Rinse 30 sec in H_2O.			X
11. (c) Hang vertically and rinse with H_2O from wash bottle for 2 min. Dry in air			X

All water used is distilled water.

TABLE XVII. PREPARATION OF SOLUTION E

1. All apparatus cleaned with chromic cleaning solution, rinsed several times in distilled water, dried in filtered compressed air, rinsed in carbon tetrachloride, dried.
2. Weighing bottle weighed while empty.
3. Glass capillary heated in bunsen flame to red heat for one minute. After cooling, dip in oil. Drop which collects at end dropped into weighing bottle.
4. Re-weigh bottle to obtain weight of oil.
5. Dissolve oil in a little carbon tetrachloride, transfer to 100 ml volumetric.
6. Fill volumetric, flush out weighing bottle again with solution from volumetric and pour back into volumetric.
7. Draw up 1 ml of solution into transfer pipette, and discard it.
8. Repeat (7) twice, then transfer to second volumetric and fill to 100 ml with carbon tetrachloride.
9. Discard, and repeat (8).
10. Draw up 1 ml into calibrated pipette. Discard.
11. Repeat (10) several times, then adjust flow rate to desired rate and apply drops to panel.

been used. This was necessary because of the manner in which the data were taken. In each run, a 1000-fold range of oil concentration was used, using 18 readings. The 18 values of oil concentration used were distributed, for maximum effectiveness, in such a way that the points obtained are more or less evenly spaced on a plot of log oil concentration vs. C.I. Thus, on an arithmetic plot, most of the points would be crowded near one end of the graph. In obtaining the arithmetic mean of the transitional C.I. region, then, great weight would be placed on a few readings at one end of this region, with the other end of this region containing most of the total readings taken. Thus, the log-mean can be obtained with greater accuracy. While this leads to the choice of the less conservative solution, it can be argued that this is not entirely objectionable anyway, since the test under consideration might be considered as detecting the presence of oil anywhere in the transitional region. Table XX gives an actual example of the use of this method.

(e) *Langmuir-Blodgett Multilayers*

In 1917, Langmuir first reported[284] that a monomolecular layer of an oil can be spread on water. The method used was

TABLE XVIII. OIL ADSORPTION BY EQUIPMENT

Equipment	Approximate Surface Area (cm^2)	Amount of Stearic Acid Adsorbed ($\times 10^5$ g)	Amount of Stearic Acid in Test Solution E ($\times 10^5$ g)
First 100 ml volumetric flask	382	8.2	1000
Transferring pipette	16.8	0.36	10
Second 100 ml volumetric flask	382	8.2	10
Calibrated pipette	14.6	0.31	0.1

TABLE XIX. LABORATORY DATA*

Atomizer		Water-Break	
Oil Conc. (g/cm^2)	C.I.	Oil Conc. (g/cm^2)	C.I.
1. Oil: Oleic Acid Surface: Matte, heat-tinted			
5.56×10^{-5}	0	2.78×10^{-7}	0
2.78×10^{-5}	T	2.21×10^{-7}	20
4.89×10^{-7}	T	5.56×10^{-8}	95
2.44×10^{-7}	100	2.78×10^{-8}	100
11.3×10^{-5}	0	5.81×10^{-7}	0
5.68×10^{-5}	T	2.90×10^{-7}	20
11.7×10^{-7}	T	11.3×10^{-8}	90
5.85×10^{-7}	100	5.68×10^{-8}	100
2. Oil: Oleic Acid Surface: Matte, passivated			
11.1×10^{-5}	0	11.7×10^{-7}	0
5.56×10^{-5}	T	5.87×10^{-7}	20
1.47×10^{-5}	T	1.67×10^{-7}	90
0.976×10^{-6}	100	1.11×10^{-7}	100
11.3×10^{-5}	0	11.6×10^{-7}	0
5.68×10^{-5}	T	5.81×10^{-7}	20
2.32×10^{-5}	T	2.26×10^{-7}	90
1.75×10^{-6}	100	1.71×10^{-7}	100
3. Oil: Stearic Acid Surface: Matte, heat-tinted			
10.3×10^{-5}	0	2.58×10^{-7}	0
5.17×10^{-5}	T	2.06×10^{-7}	30
1.03×10^{-5}	T	2.58×10^{-8}	90
0.516×10^{-5}	100	2.06×10^{-8}	100
5.13×10^{-5}	0	2.05×10^{-7}	0
2.56×10^{-5}	T	1.54×10^{-7}	20
0.521×10^{-5}	T	2.08×10^{-8}	95
0.260×10^{-5}	100	1.57×10^{-8}	100
4. Oil: Stearic Acid Surface: Matte, passivated			
10.3×10^{-5}	0	5.11×10^{-7}	0
5.17×10^{-5}	T	2.56×10^{-7}	30
1.03×10^{-5}	T	2.06×10^{-7}	90
0.516×10^{-5}	100	1.55×10^{-7}	100
10.3×10^{-5}	0	6.85×10^{-7}	0
5.13×10^{-6}	T	3.42×10^{-7}	10
1.57×10^{-5}	T	10.3×10^{-8}	95
1.04×10^{-6}	100	5.13×10^{-8}	100

Atomizer		Water-Break	
Oil Conc. (g/cm^2)	C.I.	Oil Conc. (g/cm^2)	C.I.
5. Oil: Tristearin Surface: Matte, heat-tinted			
2.09×10^{-7}	0	5.06×10^{-7}	0
1.57×10^{-7}	T	2.53×10^{-7}	50
1.96×10^{-5}	T	1.57×10^{-7}	95
1.47×10^{-5}	100	1.05×10^{-7}	100
2.06×10^{-7}	0	14.0×10^{-7}	0
1.55×10^{-7}	T	7.00×10^{-7}	20
1.76×10^{-5}	T	1.55×10^{-7}	95
1.17×10^{-5}	100	1.03×10^{-7}	100
6. Oil: Tristearin Surface: Matte, passivated			
5.06×10^{-7}	0	1.52×10^{-6}	0
2.53×10^{-7}	T	1.01×10^{-6}	10
1.57×10^{-7}	T	2.62×10^{-7}	95
1.05×10^{-7}	100	2.09×10^{-7}	100
7.00×10^{-7}	0	2.10×10^{-6}	0
3.49×10^{-7}	T	1.40×10^{-6}	20
2.06×10^{-7}	T	3.49×10^{-7}	90
1.55×10^{-7}	100	2.58×10^{-7}	100
7. Oil: Mineral Oil Surface: Matte, heat-tinted			
2.58×10^{-6}	0	2.06×10^{-5}	0
2.19×10^{-6}	T	1.55×10^{-5}	20
10.3×10^{-6}	T	10.3×10^{-6}	70
5.16×10^{-5}	100	5.16×10^{-6}	100
2.14×10^{-6}	0	2.31×10^{-5}	0
1.62×10^{-6}	T	1.75×10^{-5}	10
5.83×10^{-5}	T	2.70×10^{-6}	95
2.91×10^{-5}	100	2.14×10^{-6}	100
8. Oil: Mineral Oil Surface: Matte, passivated			
2.76×10^{-6}	0	2.06×10^{-5}	0
2.19×10^{-6}	T	1.55×10^{-5}	20
1.55×10^{-7}	T	11.0×10^{-7}	90
1.03×10^{-7}	100	5.51×10^{-7}	100
2.14×10^{-6}	0	2.31×10^{-5}	0
1.62×10^{-6}	T	1.75×10^{-5}	10
1.75×10^{-7}	T	2.14×10^{-6}	95
1.16×10^{-7}	100	1.62×10^{-6}	100

*Replicate readings were made with separately prepared solutions of the soil in carbon tetrachloride.

TABLE XIX Continued

Atomizer		Water-Break	
Oil Conc. (g/cm^2)	C.I.	Oil Conc. (g/cm^2)	C.I.
9. Oil: Lard Oil **Surface: Matte, heat-tinted**			
2.23×10^{-7}	0	11.4×10^{-7}	0
1.69×10^{-7}	T	5.70×10^{-7}	50
1.57×10^{-8}	T	2.81×10^{-7}	95
1.04×10^{-8}	100	2.23×10^{-7}	100
5.16×10^{-7}	0	1.55×10^{-6}	0
2.58×10^{-7}	T	1.03×10^{-6}	30
3.02×10^{-8}	T	1.60×10^{-7}	95
2.28×10^{-8}	100	1.07×10^{-7}	100
10. Lard Oil **Surface: Matte, passivated**			
5.70×10^{-7}	0	1.71×10^{-6}	0
2.87×10^{-7}	T	1.14×10^{-6}	30
1.69×10^{-7}	T	5.70×10^{-7}	90
1.12×10^{-7}	100	2.87×10^{-7}	100
5.16×10^{-7}	0	1.55×10^{-6}	0
2.58×10^{-7}	T	1.03×10^{-6}	40
10.7×10^{-8}	T	5.16×10^{-7}	90
5.34×10^{-8}	100	2.58×10^{-7}	100
11. Oil: Lard Oil **Surface: Polished, heat-tinted**			
1.97×10^{-7}	0	16.5×10^{-7}	0
1.31×10^{-7}	T	8.27×10^{-7}	10
7.85×10^{-9}	T	1.97×10^{-7}	90
3.93×10^{-9}	100	1.31×10^{-7}	100
2.49×10^{-7}	0	12.9×10^{-7}	0
1.88×10^{-7}	T	8.56×10^{-7}	30
10.0×10^{-9}	T	2.49×10^{-7}	95
5.04×10^{-9}	100	1.88×10^{-7}	100
12. Oil: Mineral Oil **Surface: Polished, heat-tinted**			
6.85×10^{-7}	0		
3.42×10^{-7}	T	3.42×10^{-6}	10
2.11×10^{-8}	T	3.42×10^{-7}	90
1.59×10^{-8}	100	2.76×10^{-7}	100
10.1×10^{-7}	0		
5.03×10^{-7}	T	2.51×10^{-6}	20
2.00×10^{-8}	T	5.03×10^{-7}	90
1.51×10^{-8}	100	2.51×10^{-7}	100

Atomizer		Water-Break	
Oil Conc. (g/cm^2)	C.I.	Oil Conc. (g/cm^2)	C.I.
13. Oil: SAE 10 Motor Oil **Surface: Matte, heat-tinted**			
5.53×10^{-6}	0	2.20×10^{-5}	0
2.76×10^{-6}	T	1.66×10^{-5}	20
1.61×10^{-7}	T	15.9×10^{-7}	95
1.07×10^{-7}	100	7.95×10^{-7}	100
10.2×10^{-7}	0	10.1×10^{-6}	0
5.11×10^{-7}	T	5.08×10^{-6}	10
10.6×10^{-8}	T	2.04×10^{-6}	95
5.31×10^{-8}	100	1.53×10^{-6}	100
14. Oil: SAE 50 Motor Oil **Surface: Matte, heat-tinted**			
10.6×10^{-7}	0		
5.30×10^{-7}	T	5.30×10^{-6}	5
2.06×10^{-8}	T	1.70×10^{-7}	95
1.55×10^{-8}	100	1.13×10^{-7}	100
15. Oil: 101 Cutting Oil **Surface: Matte, heat-tinted**			
1.73×10^{-6}	0	2.06×10^{-5}	0
1.15×10^{-6}	T	1.55×10^{-5}	30
1.62×10^{-7}	T	11.5×10^{-7}	95
1.08×10^{-7}	100	5.77×10^{-7}	100
16. Oil: Mineral-Lard Cutting Oil **Surface: Matte, heat-tinted**			
1.73×10^{-7}	0	3.96×10^{-6}	0
1.15×10^{-7}	T	2.98×10^{-6}	10
7.84×10^{-9}	T	2.30×10^{-7}	95
3.92×10^{-9}	100	1.73×10^{-7}	100
17. Oil: 66.0 per cent Oleic Acid + Mineral Oil **Surface: Matte, heat-tinted**			
5.39×10^{-8}	0	2.59×10^{-7}	0
2.69×10^{-8}	T	2.15×10^{-7}	10
10.7×10^{-9}	T	5.39×10^{-8}	95
5.39×10^{-9}	100	2.69×10^{-8}	100
18. Oil: 32.8 Per Cent Oleic Acid + Mineral Oil **Surface: Matte, heat-tinted**			
11.2×10^{-8}	0	5.82×10^{-7}	0
5.62×10^{-8}	T	2.91×10^{-7}	20
4.86×10^{-9}	T	11.2×10^{-8}	95
2.43×10^{-9}	100	5.62×10^{-8}	100

TABLE XIX Continued

Atomizer		Water-Break	
Oil Conc. (g/cm^2)	C.I.	Oil Conc. (g/cm^2)	C.I.
19. Oil: 20.8 Per Cent Oleic Acid + Mineral Oil Surface: Matte, heat-tinted			
1.72×10^{-7}	0	14.4×10^{-7}	0
1.14×10^{-7}	T	7.24×10^{-7}	10
5.22×10^{-9}	T	2.28×10^{-7}	95
2.60×10^{-9}	100	1.72×10^{-7}	100
20. Oil: 14.0 Per Cent Oleic Acid + Mineral Oil Surface: Matte, heat-tinted			
1.60×10^{-7}	0	1.60×10^{-6}	0
1.06×10^{-7}	T	1.06×10^{-6}	20
1.38×10^{-9}	T	2.66×10^{-7}	90
0.916×10^{-9}	100	2.12×10^{-7}	100
21. Oil: 6.7 Per Cent Oleic Acid + Mineral Oil Surface: Matte, heat-tinted			
2.16×10^{-7}	0	2.45×10^{-6}	0
1.62×10^{-7}	T	1.95×10^{-6}	10
1.42×10^{-8}	T	4.90×10^{-7}	90
0.945×10^{-8}	100	2.45×10^{-7}	100

Copper Dip		KFC	
Oil Conc. (g/cm^2)	C.I.	Oil Conc. (g/cm^2)	C.I.
22. Oil: Lard Oil Surface: Matte, benzene dried			
1.69×10^{-4}	0	11.2×10^{-5}	0
1.12×10^{-4}	T	5.63×10^{-5}	T
10.9×10^{-6}	T	2.72×10^{-5}	T
5.45×10^{-6}	100	2.17×10^{-5}	100
1.52×10^{-4}	0	5.06×10^{-5}	0
1.01×10^{-4}	T	2.79×10^{-5}	T
1.11×10^{-6}	T	1.68×10^{-5}	T
5.58×10^{-6}	100	1.11×10^{-5}	100

Copper Dip		KFC	
Oil Conc. (g/cm^2)	C.I.	Oil Conc. (g/cm^2)	C.I.
23. Oil: Mineral Oil Surface: Matte, benzene dried			
		2.12×10^{-4}	0
		1.59×10^{-4}	T
		5.31×10^{-5}	T
		2.65×10^{-5}	100
		2.14×10^{-4}	0
		1.61×10^{-4}	T
		10.7×10^{-5}	T
		5.37×10^{-5}	100

Fluor. dye 1 min exposure		Fluor. dye 4 min exposure	
24. Oil: Lard Oil Surface: Matte, benzene dried			
2.70×10^{-4}	0	1.62×10^{-4}	0
2.15×10^{-4}	T	1.08×10^{-4}	T
1.62×10^{-4}	T	10.8×10^{-5}	T
1.08×10^{-4}	100	5.4×10^{-5}	100
15 min exposure		60 min exposure	
5.40×10^{-5}	0	2.11×10^{-5}	0
2.70×10^{-5}	T	1.59×10^{-5}	T
2.11×10^{-5}	T	10.6×10^{-6}	T
1.59×10^{-5}	100	5.30×10^{-6}	100
25. Oil: Mineral Oil Surface: Matte, benzene dried			
15 min exposure		(delayed exposure)	
10.4×10^{-5}	0	1.56×10^{-4}	0
5.19×10^{-5}	T	1.04×10^{-4}	T
2.98×10^{-5}	T	5.19×10^{-5}	T
2.36×10^{-5}	100	2.60×10^{-5}	100

to prepare a dilute solution of a polar material (such as a fatty acid) in carbon tetrachloride, allow a drop of this solution to fall on a water surface and allow the solvent to evaporate. The oil remaining was found to be spread out on the water surface as a monomolecular layer, with a characteristic area covered by each oil molecule. Curves of area covered/molecule vs. surface pressure were prepared for many classes of compounds. It was found that such films presented a sort of "flat", or two-dimensional, system[287], containing many interesting analogies to the usual three-dimensional concept of physical chemistry. It was found, for example, that these monolayers can occur in four (rather than three) physical states: solid, liquid-expanded, liquid-condensed, and gaseous. No attempt will be made here to give a comprehensive bibliography or extended treatment of this subject. The interested reader is referred to any standard text on surface chemistry (consult a previous project bibliography[108f]), and in particular to articles by Langmuir[281] reviewing his work on surface films and a recently published book[289] by the same author.

In 1920, Langmuir[286] first reported on the application of such monolayers to solids. He found that a glass plate brought up through a water surface covered by a

monomolecular film of some fatty substance has its contact angle against water greatly increased. He also found that the plate area equals the decrease in area of the monofilm on the water surface. At the same time, he also devised the "talc test" for cleanliness. The water surface is dusted with talc. The glass slide is dipped into the water. If the slide is oily, the talc is repelled on the water surface due to the spreading of the oil. It was found that a monolayer of oleic acid barely registers in the talc test. A later test for metal cleanliness[281] is based on this same principle.

In 1934, K. B. Blodgett[276], a co-worker of Langmuir's, discovered that multilayers could be built up on glass or metal surfaces by transferring the monolayer on water to the solid surface one layer at a time by successive dippings and removals from the water bath. The layers could be deposited at the rate of 10–15 per minute. In the earliest experiments reported, films were deposited on glass, chromium, nickel, silver, platinum, iron, steel, and brass surfaces. The films consisted of palmitic, stearic, and arachidic acids. It was found that the water had to contain certain metal ions in order to insure good adhesion. Among these metals were calcium magnesium, strontium, barium, lead, and zinc.

The multilayers could be seen readily (eleven or more layers) by means of vivid interference colors produced. Under suitable conditions (polarized light at low incidence angle), even a monolayer could be seen. In order to secure good adhesion of the first layer, it was found necessary to use highly polished surfaces. Blodgett measured the thickness of various types of multilayers by means of the interference of monochromatic and polarized light[277,278]. By suitably adjusting the thickness of the multilayer, it was found possible to create non-reflecting glass.

In the same year (1934), Langmuir[286] summarized the information then available on the properties of oil films on solids. With respect to work of interest in this project, he found that a drop of water placed on a glass surface covered with a monolayer will exhibit a high contact angle. In general, he found hysteresis of the contact angle to be great on such monolayers. He proposed that when a drop of water is placed on a monolayer, some of the adsorbed oil molecules which are crowded by their neighbors reverse their orientation, so that the $-COOH$ attaches itself to the water drop, thus causing great hysteresis. Thus, he found that the contact angle of water against stearic acid, which should be 110°, was but 50° for 3 layers of calcium stearate on glass.

TABLE XX. RECORDING SENSITIVITY VALUES

(Atomizer Test)

Oil Concentration ($g/cm^2 \times 10^8$)	C.I.	Transitional C.I. Range ($g/cm^2 \times 10^8$) Log	Arith.	Sensitivity ($g/cm^2 \times 10^8$) Log Mean	Arith. Mean
22.3	0	19.4	19.6	5.0	10.5
16.9	T				
1.57	T	1.28	1.30		
1.04	100				

In the same reference[286], Langmuir also made the important discovery that if a stearic acid film is produced on glass by dipping the glass in a dilute film of stearic acid in benzene (analogous to the Devaux method used by the authors to prepare their samples for degreasing evaluation tests), the film has a smaller contact angle against water than one prepared by the Langmuir-Blodgett method. He proposed that the molecules of stearic acid in a dilute solvent solution diffuse one by one onto the glass surface. The first ones that arrive become firmly attached to the glass by their $-COOH$ groups. At 20° C, there is very little surface mobility of these adsorbed molecules, so that each molecule remains attached to the point at which it first arrived at the surface. After a considerable fraction of the surface is thus covered, newly arriving molecules find increasing difficulty in attaching to the glass. When the process is complete, there are still many portions of the glass not covered by $-COOH$ groups, but the vacant spaces are too small to permit the entrance of additional $-COOH$ groups. Thus, such an adsorbed film has a larger spacing than one prepared via the Langmuir-Blodgett method (where the monolayer is originally prepared on a water surface of high molecular mobility). The upper surface thus consists in greater part of $-CH_2-$ groups, rendering it less hydrophobic and less oleophobic. See also the observations of the present authors on oil spreading rates[103] which indicate that the surface orientation of oleic acid molecules deposited from a polar solvent is poor.

Langmuir and Schaefer[291] studied the composition of films of fatty acids deposited on metals from water containing Ca^{++} and Ba^{++} ions. For Ba^{++} ions, they found that:

$$\log \frac{(f)}{(1-f)} = -2.41 + 0.367\,(p\mathrm{H})$$

where f = fraction of film present as soap, rather than as free fatty acid.

In depositing multilayers, three types of deposition may occur:

X—layers: deposit only when panel enters water

Y—layers: deposit both when panel enters water and when it leaves water

Z—layers: deposit only when panel leaves water.

Langmuir[289] and Bikerman[275] report that the type of film obtained is a function of the water-solid contact angle. If the angle is greater than 94°, X-films are obtained; if the angle is less than 80°, Z-films are obtained; in other cases, Y-films are obtained. If an odd number of layers is present, the surface is hydrophobic[288,290], if an even number is present, the surface is hydrophilic.

Bikerman[275] showed that the multilayers consist of films stretched across the irregularities of the solid surface and touching the surface at discreet points only. These stretched films burst soon after deposition and give rise to gel structures or to more or less oriented microcrystals. Thus, using a wire gauze, he found the area of monofilm taken up from water to be equal to the geometric area of the gauze, not to its actual area.

The multilayers deposited by the Langmuir-Blodgett method have been found to be crystalline[279,280,282]. Some studies have been made of the orientation of these crystallites[282,295].

In order to obtain a qualitative check upon the wetting sensitivity results obtained using the Devaux technique and upon the oil spreading rates reported in a previous paper[103], a few comparison runs were made utilizing Langmuir-Blodgett multilayers*.

In the runs reported here, the tray was filled with water containing 6 mg/l $BaCl_2$ and 34 mg/l $NaHCO_3$, at pH = 6. In addition to the polished chromium sam-

*The authors are indebted to Dr. Benjamin Carroll of the Chemistry Department, Columbia University, who made available a brass tray and windlass suitable for such experiments, and a chromium plate containing 11, 21, 31, 41, 51, and 61 layers of barium stearate-stearic acid films.

TABLE XXI. CONDITIONS FOR MULTI-LAYER EXPERIMENTS

Layers of Stearic Acid + Ba Stearate	Polished Chromium Plate	Polished Steel	Matte Steel
1	XO	XO	XO
11	XO*	XO	XO
21	XO*	XO	X
31	XO*	XO	
41	XO*	X	
51	XO*	X	
61	XO*	X	

Key: X Water-break test O Oil spreading rate
* Surface supplied by Dr. B. Carroll

TABLE XXII. SENSITIVITY OF THE ATOMIZER TEST COMPARED WITH INITIAL STEAM CONDENSATION PATTERN

Oil	Sensitivity (g/cm^2)		Ratio of Sensitivities Condensation / Atomizer
	Atomizer ($\times 10^3$)	Initial Condensation ($\times 10^3$)	
Stearic Acid	1.6	1.1	0.69
Oleic Acid	1.8	2.2	1.22
Tristearin	4.7	3.5	0.75
Lard Oil	6.7	3.8	0.57
Mineral Oil	30	25	0.83

ple obtained from Dr. Carroll, both matte and polished steel panels were used. The steel was prepared using method (b) "heat tinting" (see Table XVI). California talc was spread on the water surface, and it was found that whether the sample was immersed wet or dry, oil was not deposited on the first immersion. It was deposited thereafter, however, both going down and going up. Corrosion of the steel was no problem if, after heat tinting, the sample was immersed while dry. On the first immersion (if the rate was low), the sample came out of the water completely dry. It was found very easy to deposit multilayers on both matte and polished steel surfaces, and, after about 9 layers, the interference colors became visible; they were quite vivid and uniform. Table XXI indicates the runs made. According to the equation given above, the stearic acid layers are 38 per cent barium soap.

All samples showed complete water-break. This is in accord with results previously obtained with the Devaux method, indicating that about ½ a monolayer of stearic acid will cause water-break.

Mineral and lard oils and oleic acid did not spread on any of the polished surfaces. This is in complete accord with the results reported in the previous paper[103]. The contact angles were high for eleven or more layers, but much smaller for one layer. On matte surfaces, there was a very slight spreading of mineral oil for one layer, but if this surface were rinsed thoroughly in carbon tetrachloride, mineral oil then spread rapidly on the surface. This, too, is in accord with the results obtained previously[103].

(f) *Drop-Wise Condensation*

In 1842, Moser[307] first noted that "breath figures" could be used to determine the presence of grease on a surface. This observation was verified the following year by Waidele[308]. A "breath figure" is the pattern obtained when a person breathes upon the test surface. Where the surface is clean, the breath condenses as a thin film and evaporates (with the formation of interference fringes on smooth surfaces) in a very short period of time, and is thus not readily detected. Where the surface is oily, the breath condenses in the form of small droplets of high contact angle. Because of their greater thickness, these drops take longer to evaporate, and are therefore more readily detected. Visually, such areas look somewhat milky, and can be readily contrasted with clean areas. The effect may be partially obscured by colloids present in the breath.

In the period when Matthew Brady was making his famous Civil War photographs, the wet collodion process was prevalent. It was customary to determine the cleanliness of the glass plates which were to receive the wet collodion solution by the use of "breath figures"[304]. To the best of the authors' knowledge, this is probably the first historical use of a degreasing evaluation test for routine control purposes. In the latter part of the 19th and early 20th centuries, occasional reference to "breath figures" appears in the literature. Aitken[304] in 1893 ascribed lack of drop formation to dust. Apparently the first observer to arrive at conclusions substantially in accord with modern belief was Rayleigh[306] in 1911, who ascribed drop formation to the presence of extremely minute oil residues. Even in recent years, notably in the French and German literature, "breath figures" are referred to when the surface cleanliness is being described.

The first modern scientific approach to the phenomenon of drop-wise condensation, however, came about from a completely different consideration. Around 1930, a number of investigators in Germany[300,308], Indonesia[307], and the United States[294,301] investigated the reason for irregularities in heat transfer coefficients sometimes observed in tubes used to condense steam. It was found that the value of the heat transfer coefficient was much higher (5–8 times higher according to Schmidt, et al[308] and 15–20 times higher according to Drew, et al[294]) if the steam condensed in the form of drops, than if it condensed as a film, completely wetting the wall. Readers interested in further details will find a good table outlining work prior to 1935 in a paper by Drew, et al[294] and a literature survey up to 1937 in a paper by Fritz[297].

Early interpretations of the cause of drop-wise condensation were often quite wrong. Schmidt[308], for example, stated that clean, smooth surfaces give drop-wise condensation, while unclean, roughened (by pickling) surfaces give film condensation. The difficulty in many cases seems to have arisen from a lack of appreciation of the influence of traces of oil on wettability of a surface. Thus, shiny, polished chromium plates were recorded as causing drop-wise condensation when "clean", whereas, actually, the plates were undoubtedly contaminated with traces of oily residues (particularly adsorbed layers of fatty materials) from the buffing and polishing operations. The first adequate, systematic approach to the problem was made by Drew and coworkers in the 1930's. They correctly deduced (1) that drop-wise condensation is caused by oily contaminants present on the surface and (2) that for persistent drop-wise condensation to occur, the oily material should be strongly adsorbed to the metal surface. The presence of non-condensible gases was also found to promote drop-wise condensation, which is again in accord with theory as adsorbed gases are generally hydrophobic. This effect was also brought out in a paper by Meisenburg, et al[302]. Drew also found that drop-wise condensation is easier to obtain on polished surfaces than on rough, which is in accord with evidence discussed in a previous project publication[103] on the effect of roughness on contact angle.

In the late 1930's, further refinements

in the theory of drop-wise condensation were made, and further experimental evidence brought forth. A paper by Jakob[199], one of the early German pioneers, summarized the theoretical background well. Gnam[203] published an article containing some very good photographs of condensation patterns for several values of the contact angle. He was also the first to use the concept of the "spreading coefficient" in the interpretation of results. Another extensive theoretical discussion was given by Emmons[206] who emphasized that a Langmuir-Blodgett monolayer is sufficient to account for the facts observed. He also found that additional oil layers are readily removed by the steam. In 1940, Shea and Krase[204] presented many values of heat transfer coefficients as modified by the presence of drop-wise condensation. A very detailed picture of the mechanism of drop-wise condensation, including an extensive mathematical treatment, was given by Fatica and Katz[206] in 1949. They took exception to some of Emmons' conclusions concerning the mechanism of drop-wise condensation. In particular, they concluded from their theory that less than a complete monolayer could cause such condensation, and verified this with some indirect experimental observations, this being in accord with previous work of Devaux[210].

From what has been said above, it is evident that the condensation phenomena must bear a close relation to the wetting-type degreasing evaluation tests studied in this project. To establish this relation, the authors conducted a few simple experiments. A one-liter beaker was filled with 100 ml of water brought to the boil. The beaker is covered at the top, and when ready for testing, the cover is removed, and the test panel placed horizontally at the top, test face down, for any desired period of time. Two more or less reproducible condensation patterns were formed: (1) the pattern obtained on about 1 sec exposure of the panel and (2) the pattern obtained after flooding of the panel with condensate. The former pattern closely resembles the atomizer test pattern, the latter pattern, the water-break test pattern. Table XXII presents the results obtained for 1 sec exposures to steam. It will be noted that oils typical of all types (spreading, partial spreading, and non-spreading) are included. The method of recording results is the same as that used with the atomizer test. In all cases, the sensitivity of the initial steam condensation pattern is comparable to the atomizer test, and in 4 of 5 cases, somewhat more sensitive.

If one considers the condensation mechanism proposed by Fatica and Katz[206], initial condensation on a hydrophobic surface should take place by formation of a thin film which immediately draws up into drops. The equilibrium value of drop size would be very small. As additional steam condenses, these drops grow and coalesce, keeping approximately the same contact angle with the surface. As the method of producing the pattern in this case is quite similar to that in the atomizer test, it should be expected that the two tests should be equivalent. The slightly greater sensitivity of the condensation observations is probably due to the smaller size of the droplets initially (cf.[103f] for drop-size distribution in the atomizer test) and to their greater uniformity (in the atomizer test, the "transitional" C.I. range—see Recording of Results, 5d above—encompassed about a 10-fold oil concentration range while in the steam condensation tests, the value was about 6-fold).

If the panel is exposed to the steam for several seconds, the condensate floods the panel and, on examination, the pattern obtained will depend on the value of the receding contact angle, so that the pattern then resembles closely that obtained in the water-break test. Condensation methods are not useful as degreasing evaluation tests for several reasons, among the more important of which are (1) the rate of condensation is all-important, and this cannot be readily controlled unless the test piece is in the form of a pipe, and (2) contacting with hot steam accelerates the rate of both spreading and removal of oil.

(g) *Nomenclature*

A, B, etc.—concentration of test solution (Table I)
(a), (b), (c)—method of surface preparation (Table XVI)
a, b—constants
C.I.—cleaning index = per cent of panel area which is "clean"
L—confidence limit at the 0.05 level of significance
n—number of samples
t—temperature
t—test of significance of the value of the difference in the value of the means of two sets of samples
T—transitional C.I. value
V—volume
σ—standard deviation
Θ—time

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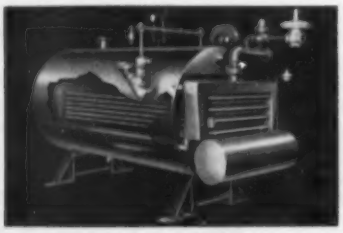

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QUESTION BOX

readers' questions of general interest

Q. 158. We are compiling information on safety in plating rooms and are particularly interested in guarding against rash and allergy from nickel solutions. Also concerned are vapor degreasers, trichlorethylene, sulfuric acid, hydrochloric acid and caustic cleaners.

A. Good housecleaning coupled with the use of protective creams or lotions have been found to be satisfactory answers to this problem in the past. (The names of suppliers were furnished along with literature on control of dermatitis.)

Q. 159. Some of our cast iron parts are nickel and chromium plated. We do get a small amount of frost, however, which incidentally buffs off. Parts are then wrapped in paper until they reach the dealer. Dealers complain of frost reappearing after a short time in display rooms. Will you kindly suggest a possible cure for this condition

A. Plate the castings to a thickness of at least 0.001 inch and better in a cold nickel solution at a current density of about 6 to 8 amperes per square foot. Following this lengthy plating operation with a buffing step plus a flash of chromium plate should give a product that will not be as troublesome as that described.—Louis Donroe.

Q. 160. Is there a synthetic resin or plastic which can be used for covering the inside of a watch case? The purpose of this filling is to prevent gold plating of the inside of the case while the outside is being gold plated.

A. There are a number of masking materials or stop-off lacquers which can be used for the purpose described (names of suppliers were furnished).—A. Korbelak.

Q. 161. Is it possible to economically vapor coat steel evenly, with 0.003 to 0.004 inches of aluminum which will then be anodized to produce a hard wearing surface?

A. The conventional vapor coating techniques do not deposit a coating approaching the thickness desired above. In the alumnizing of glass reflector type envelopes (sealed beam headlamps, etc.) the coating is approximately 6 millionths of an inch in thickness. Other decorative aluminized coatings are thinner—strong light would be seen through them. Sprayed coatings may be too porous, but will give the desired thickness. Gas plating is not economical. The best solution to the problem appears to be in the purchase of bimetallic stock in which aluminum clad material is a regular production item.—A. Korbelak-H. H. Haft.

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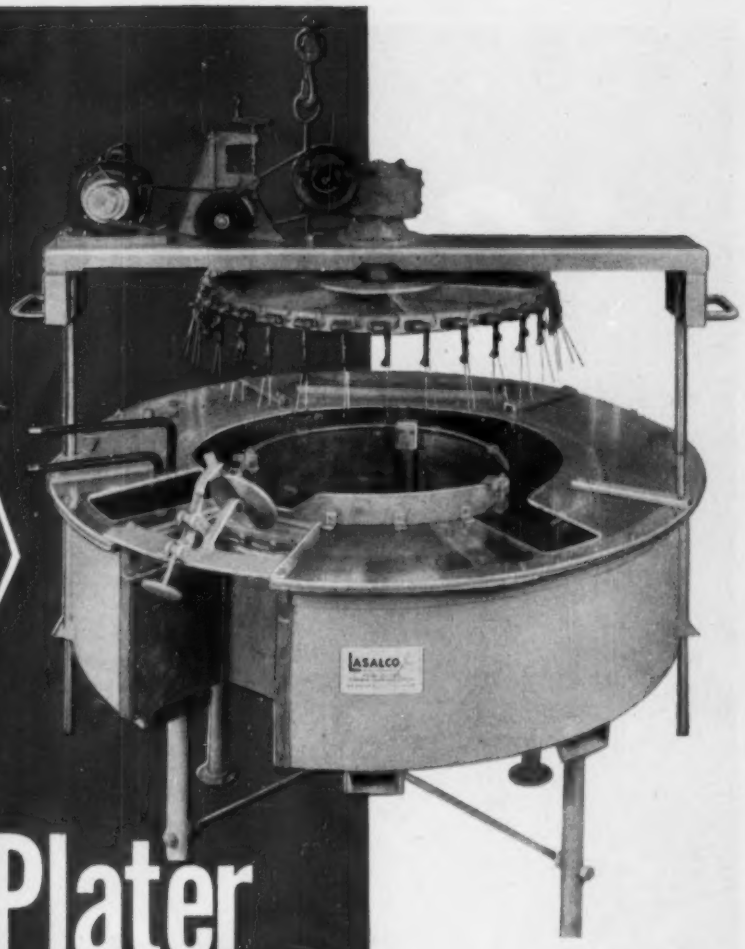

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Anodes, Flat 6% Antimonial Lead ¼" x 6". Three 26" Long; Two 24" Long; Two 2" Long; One 5" Long.
Tank Diameter 54"; Depth 14"
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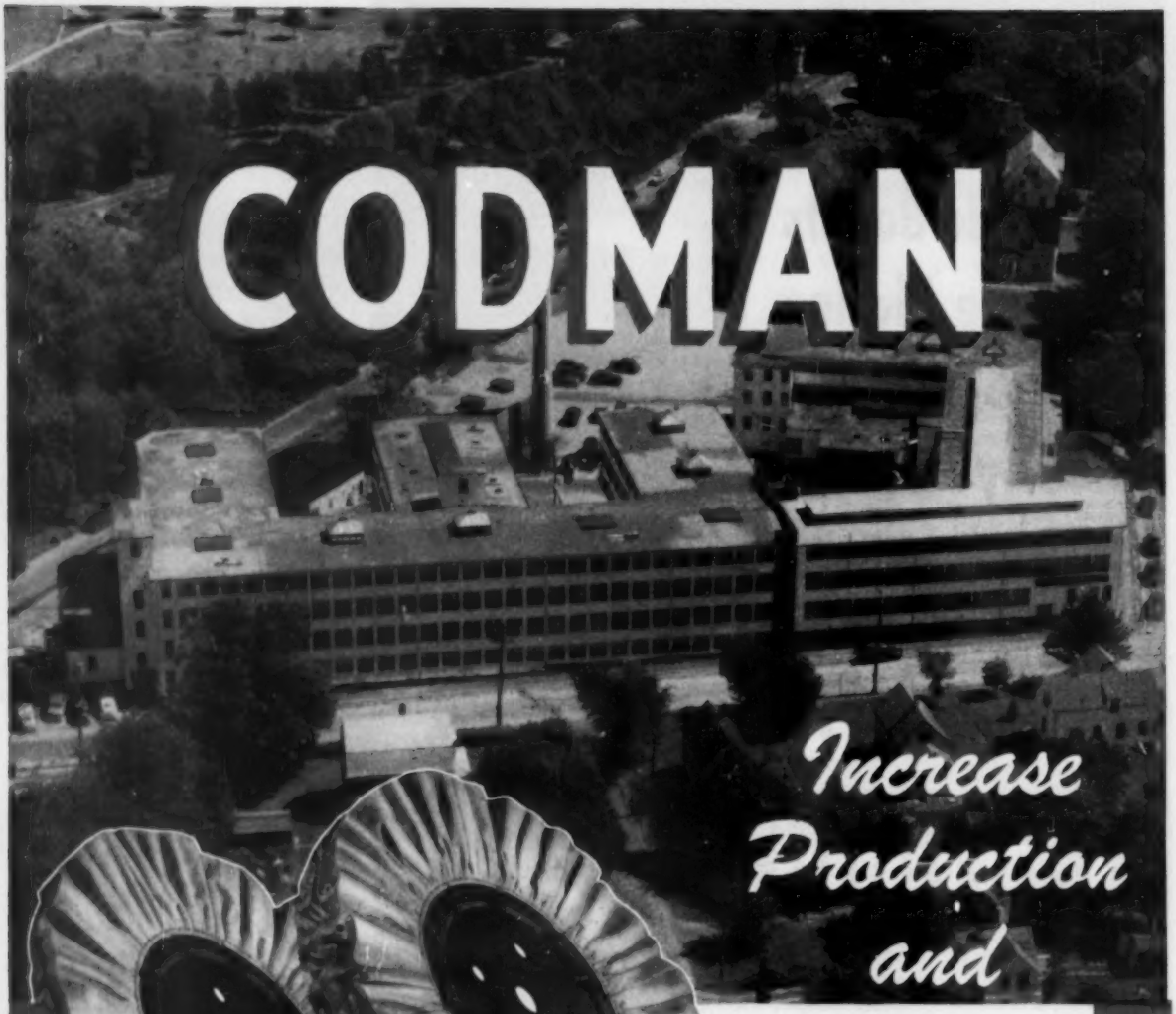

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Fellow Members and Guests:

YOU have come to the Philadelphia Convention from far and near at considerable expense and sacrifice of time.

Your decision was based, in many cases, on experience with past memorable conventions in which you were rewarded by increasing your technical knowledge from the papers and discussions, by meeting old friends and making new ones and by enjoying yourself in the many social functions, all characterized by relaxation and congeniality.

To meet these objectives, your Philadelphia Convention Committee has worked over a period of many months planning and arranging the activities given in this program.

Many people will participate and help us in carrying out the many features planned. These include the authors and chairmen of the Educational Sessions, A. E. S. officials, volunteers from the Philadelphia, Allentown-Reading and Lancaster Branches and many others.

We hope that you too will actively participate in the various activities and make this Convention your own. We hope your stay will be both profitable and enjoyable.

We are here to serve you. Call on us frequently and freely.

Welcome to the Philadelphia Convention and to Philadelphia, the birthplace of our Country and "The Workshop of the World".

Philadelphia Convention Committee

Samuel Heiman

General Chairman

CONDENSED PROGRAM

Eastern Daylight Saving Time Used Throughout This Program

CONVENTION REGISTRATION

CONVENTION REGISTRATION is on the Mezzanine Floor.

Sunday, June 14	1:00 P. M.– 8:00 P. M.
Monday, June 15	8:00 A. M.– 5:00 P. M.
Tuesday, June 16	8:00 A. M.– 4:00 P. M.
Wednesday, June 17	8:00 A. M.–12:00 Noon
Thursday, June 18	8:00 A. M.–12:00 Noon

The registration fee of $15.00 provides each registrant with a book of tickets for the various events.

Table reservations for the Banquet on Thursday, June 18, should be made in advance at the Banquet Reservation Desk on the Mezzanine Floor, starting Wednesday, June 17, at 9:00 A. M.

All events will be held in The Benjamin Franklin Hotel, unless otherwise noted.

Ladies' Program on Page 656

SUNDAY, JUNE 14, 1953

10:00 A. M.

EXECUTIVE BOARD MEETING in the Executive Secretary's suite.

2:00 P. M.

METAL FINISHING SUPPLIERS' ASSOCIATION, INC., BOARD OF DIRECTORS' MEETING, Benjamin Franklin Hotel.

8:30 P. M.

INFORMAL PARTY FOR CONVENTION EARLYBIRDS, Betsy Ross Room.

MONDAY, JUNE 15, 1953

10:00 A. M.

OPENING SESSION AND BUSINESS MEETING, Crystal Ballroom.

12:00 Noon

METAL FINISHING SUPPLIERS' ASSOCIATION, INC., LUNCHEON, Betsy Ross Room.

12:30 P. M.

SPEAKERS' LUNCHEON, Coffee Shop, Benjamin Franklin Hotel.

2:00 P. M.

FIRST EDUCATIONAL SESSION, Crystal Ballroom. Admission by badge.

9:00 P. M.

INTERNATIONAL FELLOWSHIP CLUB OPEN HOUSE, Crystal Ballroom.
Sponsored by the Metal Finishing Suppliers' Association, Inc.
Refreshments—Dancing.
Buffet Supper served at 10:30 o'clock.
Admission by ticket.

TUESDAY, JUNE 16, 1953

8:00 A. M.

SPEAKERS' BREAKFAST, Coffee Shop, Benjamin Franklin Hotel.

9:00 A.M.

SECOND EDUCATIONAL SESSION, Crystal Ballroom. Admission by badge.

12:30 P. M.

BRANCH SECRETARIES' LUNCHEON, Room 206.

1:00 P.M.

INTERNATIONAL FELLOWSHIP CLUB ANNUAL GOLF TOURNAMENT, Merion Golf Club, Ardmore.

2:00 P. M.

THIRD EDUCATIONAL SESSION, Crystal Ballroom. Admission by badge.

8:00 P. M.

QUESTION AND ANSWER SESSION, Crystal Ballroom. Admission by badge.

WEDNESDAY, JUNE 17, 1953

8:00 A. M.

SPEAKERS' BREAKFAST, Coffee Shop, Benjamin Franklin Hotel.

9:00 A. M.

FOURTH EDUCATIONAL SESSION, Crystal Ballroom. Admission by badge.
NATIONAL FEDERATION OF METAL FINISHERS, ANNUAL MEETING, Franklin Room.

1:00 P. M.

OUTING ON THE DELAWARE RIVER. STEAMER "DELAWARE BELLE" leaves from Chestnut Street wharf at 1 o'clock. Catered luncheon will be served aboard steamer. Buses will start leaving hotel at Noon for wharf. Steamer will return about 6 o'clock. Admission by ticket.

2:00 P.M.

RESEARCH COMMITTEE MEETING aboard "DELAWARE BELLE".

7:30 P. M.

JOB PLATERS' DINNER, sponsored by the National Association of Metal Finishers, Inc., Room 206.

8:30 P. M.

Film; "Corrosion in Action", courtesy of International Nickel Company, Poor Richard Room. Running time of film —approximately 1½ hours.

THURSDAY, JUNE 18, 1953

7:45 A. M.

RESEARCH COMMITTEE BREAKFAST, Room 206.

9:00 A. M.

RESEARCH EDUCATIONAL SESSION, Crystal Ballroom. Admission by badge.

12:00 Noon

NATIONAL FEDERATION OF METAL FINISHERS, BOARD OF DIRECTORS' LUNCHEON AND MEETING, Room 210.

2:00 P. M.

FINAL BUSINESS SESSION, AMERICAN ELECTROPLATERS' SOCIETY, Crystal Ballroom.

7:00 P. M.

ANNUAL BANQUET, Crystal Ballroom. Admission only by reservation ticket. In order to be served, your registration book ticket must be exchanged for a special banquet ticket bearing a table reservation. Ticket exchange starts Wednesday, 9:00 A.M. at Banquet Reservation Desk. Excellent food, top-notch entertainment, prize awards and dancing.

Program of Sessions

MONDAY, JUNE 15, 1953

10:00 A. M.

OPENING SESSION, Benjamin Franklin Hotel, Crystal Ballroom. Delegates will register at door before entering to eliminate roll call.

INTRODUCTION OF SPEAKERS AND OFFICERS, Dr. Samuel Heiman, Convention Chairman, presiding.

Invocation by the Reverend Frank C. Meale, Oneida, N. Y.

Greetings from the Philadelphia Branch by Mr. Edwin F. Ottens.

Introduction of A.E.S. Officers and Convention Committee.

"*Tomorrow's Challenge in the Delaware Valley*", by Mr. J. Harry La Brum, President, Philadelphia Chamber of Commerce.

"*Electroplating in Australia*" by Dr. William Blum.

BUSINESS MEETING OF THE SUPREME SOCIETY. Mr. Franklyn J. MacStoker, A. E. S. President, presiding.

2:00 P. M.

FIRST EDUCATIONAL SESSION, Crystal Ballroom.

Chairman: Mr. Raymond F. Vines, Lancaster Branch.

"*Bright Gold Plating*" by Mr. Edwin C. Rinker, Sel-Rex Precious Metals, Inc., Belleville, N. J.

"*Statistical Quality Control—A New Tool for the Electroplater*" by Mr. Ezra A. Blount, Products Finishing, Cincinnati, Ohio.

"*A Corrosion Study of Various Chromium-Plated Electrodeposits*" by Dr. Henry Brown and Mr. Edwin W. Hoover, The Udylite Corporation, Detroit, Mich.

"*Iron Plating from an Alkaline Bath*" by Dr. Henry B. Linford, Columbia University, Mr. Edward F. Foley and Dr. Walter R. Meyer, Enthone, Inc., New Haven, Conn.

TUESDAY, JUNE 16, 1953

9:00 A. M.

SECOND EDUCATIONAL SESSION, Crystal Ballroom.

Chairman: Dr. R. M. Wick, Allentown-Reading Branch.

"*Black Chromium-Base Electroplating*" by Dr. Martin Quaely, Westinghouse Electric Corporation, Bloomfield, N. J.

"*Crack-Free Chromium—A New Process*" by Mr. R. Dow and Dr. J. E. Stareck, United Chromium, Inc., Detroit, Mich.

"*Cost Determination in the Industrial Chromium Plating Job Shop*" by Mr. W. F. Walton and Mr. P. B. Lonsbury, Walton and Lonsbury, Attleboro, Mass.

"*Stability of Ion-Exchange Resins Toward Chromic Acid Plating Solutions*" by Mr. C. Frederick Paulson, Permutit Company, New York, N. Y.

2:00 P. M.

THIRD EDUCATIONAL SESSION.

Chairman: Mr. George Schore, New York Branch.

"*A Study of Cyanide Decomposition*" by Dr. E. J. Serfass, Dr. Ralph F. Muraca, Lehigh University, and Dr. Walter R. Meyer, Enthone, Inc., New Haven, Conn.

"*An Evaluation of Carbonate Removal Methods*" by Mr. R. Scott Modjeska, Scientific Control Laboratories, Chicago, Ill.

"*A Further Study on the Effect of Abrasive Metal Polishing on the Character of Nickel Plate*" by Mr. Walter L. Pinner, Houdaille-Hershey Corporation, Detroit, Mich.

"*Plating on Molybdenum*" by Mr. A. Korbelak, Editor, PLATING, Newark, N.J.

8:00 P. M.

QUESTION AND ANSWER SESSION, Crystal Ballroom.

Moderator: Dr. Abner Brenner, Baltimore-Washington Branch.

Panel: Authors of Educational Session papers.

WEDNESDAY, JUNE 17, 1953

9:00 A. M.

FOURTH EDUCATIONAL SESSION.

Chairman: Mr. E. R. Bowerman, Newark Branch.

"*An Electronic Thickness Gage*" by Dr. Abner Brenner, National Bureau of Standards, Washington, D. C.

"*The Thickness of Electrodeposits by the Anodic Solution Method*" by Mr. C. F. Waite, King-Seeley Corporation, Ann Arbor, Mich.

"*Testing Organic Finishes and Interpretation of Results*" by Mr. C. O. Hutchinson, The Glidden Company, Chicago, Ill.

8:30 P. M.

Film: "*Corrosion in Action*".

Commentator: Dr. Thomas P. May, International Nickel Company. Poor Richard Room.

THURSDAY, JUNE 18, 1953

9:00 A. M.

FIFTH EDUCATIONAL SESSION—A.E.S. RESEARCH.

"*The A. E. S. Research Program*" by Dr. Donald Price, Oakite Products, Inc., New York, N. Y., Research Committee Chairman.

"*The Analysis of Electroplating Solutions for Major Constituents*" (*Project No. 2*) by Dr. E. J. Serfass, Lehigh University, Bethlehem, Pa.

"*The Effect and Removal of Chromium from Nickel Plating Solutions*" (*Project No. 5*) by Dr. D. T. Ewing, Mr. J. K. Werner, Mr. A. A. Brouwer and Mr. C. J. Owen, Michigan State College, East Lansing, Mich.

"*A Metallographic Study of Some Steels Used for Nickel Plating*" (*Project No. 14*) by Dr. A. E. R. Westman, Toronto, Canada.

"*A Progress Report on the Development of a New Accelerated Corrosion Test*" (*Project No. 15*) by Mr. Walter L. Pinner, Houdaille-Hershey Corporation, Detroit, Mich.

2:00 P.M.

FINAL BUSINESS SESSION. Crystal Ballroom.

Presiding Officer: Mr. Franklyn J. MacStoker, A.E.S. President.

Welcome, Ladies!

IT HAS been twenty-one long years since we have had the pleasure of welcoming our old A. E. S. friends to Philadelphia, and we are very happy that in the intervening years we have acquired so many new ones.

In all sincerity, we have anticipated these four days as much as we hope you have and have truly enjoyed planning for your entertainment and comfort.

Philadelphia enshrines and treasures its historic past, but the city is proud of the progressiveness that made it the birthplace of the republic and the city of brotherly love. We are justly proud to have all of you here to enjoy all it offers to visitors. Our main objective is that you will remember these few days and be pleased that you came.

Again a most hearty and sincere welcome to the Philadelphia Convention!

The Ladies' Committee

Mary F. Robson

Chairman

Ladies' Program

LADIES COMMITTEE HEADQUARTERS — INDEPENDENCE ROOM

SUNDAY, JUNE 14, 1953

8:30 P. M.

INFORMAL PARTY FOR CONVENTION EARLYBIRDS, Betsy Ross Room.

MONDAY, JUNE 15, 1953

10:00 A. M.

OPENING SESSION, Crystal Ballroom. The ladies are invited to attend with the men and hear a good keynote speaker talk on a non-technical subject.

2:00–4:00 P. M.

TEA at the Wanamaker Store Auditorium, 13th and Chestnut Streets.
Talk by Mrs. Reba Miller, *"Getting To Know Your Neighbors"* (illustrated with dolls of all nations). Admission by ticket.

9:00 P. M.

INTERNATIONAL FELLOWSHIP CLUB OPEN HOUSE, Crystal Ballroom. Sponsored by the Metal Finishing Suppliers' Association, Inc. Refreshments—Dancing. Buffet Supper served at 10:30 o'clock. Admission by ticket.

TUESDAY, JUNE 16, 1953

11:00 A. M.

AUNT ELLA SOCIETY LUNCHEON, sponsored by Oakite Products, Inc.
Host: Mr. Dave Clarin.
Buses leave hotel at 11 o'clock for Drexelbrook Inn, where luncheon will be served at 12:15. Immediately after lunch, the party will proceed by bus to Longwood Gardens, returning to the hotel by about 6 o'clock. Admission by ticket.

WEDNESDAY, JUNE 17, 1953

1:00 P. M.

OUTING on the Delaware River. Steamer "Delaware Belle" leaves from Chestnut Street wharf at 1 o'clock.
Catered luncheon will be served aboard steamer.
PLATO PARTY on board.
Hostess: Mrs. Joan T. Wiarda.
Buses will start leaving hotel at Noon for wharf. Will return about 6 o'clock. Admission by ticket.

THURSDAY, JUNE 18, 1953

9:30 A. M.

HOTEL BREAKFAST in the Garden Terrace, followed by a two-hour sightseeing trip through historic Philadelphia. Sponsored by Lea Manufacturing Company. Featured at the Breakfast will be the popular LADIES' EDUCATIONAL SESSION. Subject: *"What Every Woman Should Know"* by Mr. R. Crane of Lea. Admission by ticket.

7:00 P. M.

ANNUAL BANQUET, Crystal Ballroom. Admission only by reservation ticket. In order to be served, your registration book ticket must be exchanged for a special banquet ticket bearing a table reservation. Ticket exchange starts Wednesday, 9:00 A. M. at Banquet Reservation Desk. Excellent food, top-notch entertainment, prize awards and dancing.

The Ladies Committee

Left to right, standing: Mrs. I. W. Marcovitch, S. Heiman, W. A. Reynolds, G. M. Long, F. Fulforth, E. F. Ottens. Front row: Mrs. C. E. Boerckel, A. G. Snow, D. R. Robson (Chairman), E. R. Lanahan, A. H. Pope

ABSTRACTS OF CONVENTION PAPERS

BRIGHT GOLD PLATING, *by Edwin C. Rinker*

This paper presents the industrial requirements and applications for bright gold plating. Principles, bath composition and plate distribution are discussed. Bright and conventional electrodeposits are compared with respect to corrosion resistance, abrasion resistance, smoothness and hardness.

STATISTICAL QUALITY CONTROL—A NEW TOOL FOR THE ELECTROPLATER, *by Ezra Blount*

The principles of statistical quality control are finding increasing acceptance in the electroplating industry. The author discusses applications with respect to the variables controlled and plating plants employing such control methods. It is shown that a reduction in number of rejects as well as savings in metal can be accomplished.

A CORROSION STUDY OF VARIOUS CHROMIUM-PLATED ELECTRODEPOSITS, *by Henry Brown and E. W. Hoover*

Results are presented for outdoor (industrial atmosphere) exposure, salt-spray and humidity tests on electrodeposits as foils and when plated on steel, nickel, copper, nickel-cobalt, nickel-iron, white brass with and without a final chromium plate and then are compared and discussed in terms of inherent and induced porosity.

IRON PLATING FROM AN ALKALINE BATH, *by Edward F. Foley, Jr., Henry B. Linford and Walter R. Meyer*

An alkaline iron electroplating solution is described. The composition of the solution is given and the effect of varying the concentration of the constituents and the temperature on the cathode efficiency and operating characteristics are shown.

BLACK CHROMIUM-BASE ELECTROPLATING, *by Martin F. Quaely*

Black chromium finishes, which have good adhesion, can be easily applied and can be heated in high vacuums to 500° C are required in industry. Three baths which yield deposits to meet these conditions are described in detail with regard to composition and operating conditions.

R. F. Vines
Session Chairman

E. C. Rinker

E. A. Blount

H. Brown

E. W. Hoover

H. B. Linford

ABSTRACTS OF CONVENTION PAPERS

Crack-Free Chromium—A New Process, *by R. Dow and J. E. Stareck*

A process for producing crack-free chromium electrodeposits is described. The plating characteristics of the process and the results of outdoor exposure and salt-spray corrosion tests on steel plated by the process, with and without undercoatings, are reported. Other physical properties are reviewed and illustrated.

Cost Determination in the Industrial Chromium Plating Job Shop, *by W. F. Walton and P. B. Lonsbury*

The authors describe a method of price determination successfully used in an industrial chromium plating job shop. This method, based on a plating tank-hour charge, has variations to adapt it to the special conditions encountered in depositing heavy chromium coatings. The method described is adaptable to small or large operations.

Stability of Ion Exchange Resins Toward Chromic Acid Plating Solutions, *by C. Frederick Paulson*

A new cation exchange resin which is resistant to 40 per cent chromic acid solutions is reported in contrast to earlier resins which were unstable above 10 per cent chromic acid. A description of an ion exchange unit for service with concentrated chromic acid solutions is given and operating data are presented. The stability of anion exchangers is also discussed.

A Study of Cyanide Decomposition, *by E. J. Serfass, R. F. Muraca and Walter R. Meyer*

This paper evaluates the factors responsible for the loss of cyanide from cyanide plating solutions and presents methods of minimizing these losses. The formation of carbonate, cyanate, ammonia and formate are discussed.

An Evaluation of Carbonate Removal Methods, *by R. Scott Modjeska*

This paper presents a study of "freezing-out" and precipitation methods for the

E. F. Foley

W. R. Meyer

R. M. Wick
Session Chairman

M. Quaely

R. Dow

J. E. Stareck

ABSTRACTS OF CONVENTION PAPERS

removal of carbonate from copper, silver, zinc, cadmium and brass cyanide plating baths. Evaluation of the method is based upon the type of deposit obtained after treatment and the difficulty of the treatment.

A Further Study on the Effect of Abrasive Metal Polishing on the Character of Nickel Plate, *by Walter L. Pinner*

By means of photomicrographs, the character of steel surfaces created by various abrasive polishing procedures is shown and the effect of such surfaces on the quality of electrodeposited nickel is discussed with respect to smoothness, buffability and corrosion resistance. The beneficial effect of certain electrochemical treatments with respect to the removal of fragmented particles prior to plating is discussed.

Plating on Molybdenum, *by A. Korbelak*

A thin protective metal coating is required over molybdenum because of its poor oxidation resistance at elevated temperatures. Various methods used for the production of adherent electrodeposits over molybdenum are described. Industrial applications of electroplated molybdenum are mentioned.

An Electronic Thickness Gage, *by Abner Brenner*

An electronic thickness gage based upon the skin effect is described. This method is applicable to a large variety of coatings on basis metals if the coating and basis metal differ in conductivity, e. g., silver on brass or lead on copper. The measurements are non-destructive.

Thickness of Electrodeposits by the Anodic Solution Method, *by C. F. Waite*

This paper describes the difficulty experienced using the hydrochloric acid drop test for chromium over copper. It also details a test unit which was developed for thickness measurements based on the principle of electrolytic solution or stripping of a definite area of plate by known amount of current. This method gives results accurate to plus or minus five per cent. Other applications of the method are discussed.

W. F. Walton

P. B. Lonsbury

C. F. Paulson

G. Schore
Session Chairman

E. J. Serfass

R. F. Muraca

ABSTRACTS OF CONVENTION PAPERS

Testing Organic Finishes and Interpretation of Results, *by Carroll O. Hutchinson*

The author describes over sixty properties of organic finishing materials used as a basis of evaluating these coatings. He also lists standard test procedures for most of these properties, together with essential control conditions and typical values for some industrial products on which these tests are used. He presents a bibliography of valuable references on testing of organic finishes and interpretation of results. This paper should be a very valuable reference to those who have responsibility for organic finishes in addition to electroplated coatings.

The A. E. S. Research Program, *by Donald M. Price*

The Chairman of the Research Committee summarizes the accomplishments of the Research Committee during the past few years and stresses the value of research to the electroplating industry. Some of the problems facing the Research Committee are discussed.

The Anaylsis of Electroplating Solutions for Major Constituents, *by Earl J. Serfass*

As a part of A. E. S. Research Project No. 2 dealing with the analytical methods for the determination of trace constituents in plating baths, and trace constituents in industrial finishing wastes, a program involving the study of analytical methods for major constituents in plating baths has been completed. Methods for the analysis of the major constituents of common nickel plating baths have been evaluated. These methods include procedures for the determination of nickel, boric acid, sulfate, chloride, etc. Methods for the determination, and cost per determination have been made on all of the methods.

Evaluation of the presently available methods for major constituents have been made with a view towards presenting the plater with simple, rapid, yet precise procedures for the control of nickel and copper plating baths.

The Effect and Removal of Chromium from Nickel Plating Solutions, *by D. T. Ewing, J. K. Werner, A. A. Brouwer, and C. J. Owen*

This paper is one of a series on the effects of impurities and the purification of

R. S. Modjeska

W. L. Pinner

A. Korbelak

E. R. Bowerman
Session Chairman

A. Brenner

C. F. Waite

ABSTRACTS OF CONVENTION PAPERS

solutions for the electrodeposition of nickel. The effects of chromium as an impurity have been investigated and data are presented which indicate the accompanying changes in such physical properties of the electrolytic nickel as adhesion, ductility and hardness. The effect of chromium on covering power and salt spray corrosion resistance, is also reported.

The rate of removal of chromium from nickel plating solutions is reported for reduction followed by precipitation and the differing effects of trivalent and hexavalent chromium are pointed out.

A Metallographic Study of Some Steels Used for Nickel Plating, *by A. E. R. Westman*

A review is presented of the various types of steel-killed, semi-killed and rimming which may be encountered by the electro-plater in his work.

The micro-structures of a number of steels used in the industry and chosen more or less at random as subjects for examination are shown and discussed.

The results of a study of surface finishes having different Profilometer readings are given. In this study 5° taper sections of the polished and etched surfaces were examined and photographed at various magnifications and under various conditions of illumination. In this way the structure of the steel immediately below the polished surfaces is brought out clearly. The characteristics of this structure in various samples are dealt with and interesting information regarding the effects of different modes of surface preparation is presented.

A Progress Report on the Development of a New Accelerated Corrosion Test, *by Waller Pinner*

Based on the report of the Advisory Committee on Accelerated Corrosion Tests, a program is described including plans for the fabrication, service exposure and accelerated corrosion testing of plated parts. Numerous accelerated test methods are described, which will be preliminarily examined for correlation with service exposure results. The objective of the project is to develop an accelerated corrosion test which will correlate with outdoor performance.

C. O. Hutchinson

D. Price

D. T. Ewing

J. K. Werner

C. J. Owen

A. E. R. Westman

Plated Ware Exhibits

LAFAYETTE ROOM

AS IN previous conventions, an exhibit of Plated Ware is featured. Branches and individual members have expended considerable time and effort to provide educational displays of various plating methods and techniques.

Prizes to individual members and Branches will be awarded for the best displays. A visit to the Plated Ware Exhibits will be well worthwhile.

Branch Exhibits Committee

Edwin J. Ottens

Chairman

Plant Visitations

ARRANGEMENTS have been made for visits to the following plants: RCA-Victor, Philco Corporation, Ternstedt Division of General Motors Corporation, Snyder Manufacturing Company, Progress Manufacturing Company and Triangle Publications.

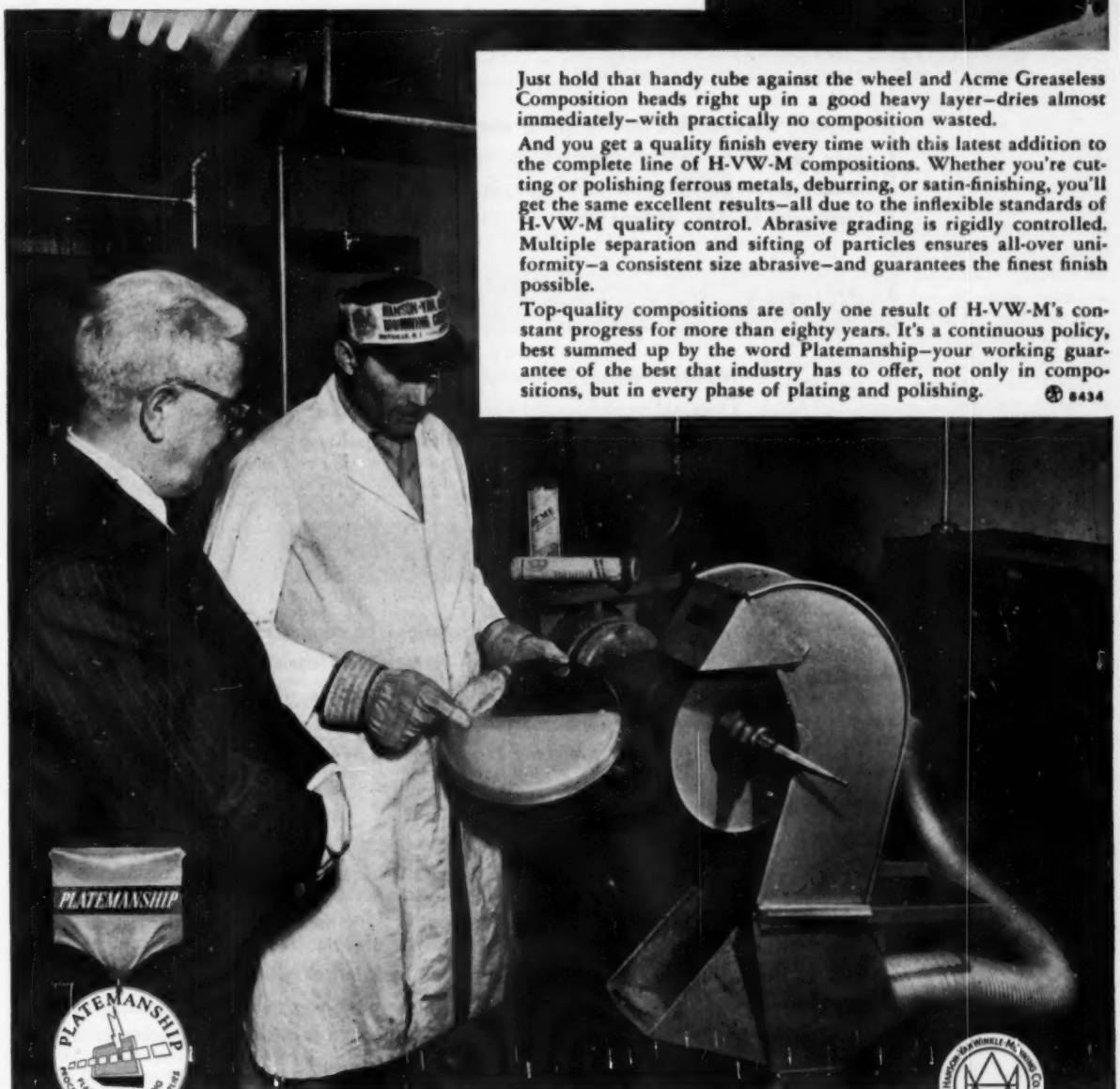
Registrants desiring to visit other plants in this area should consult a member of the Plant Visitations Committee who will assist in securing permission and arranging transportation.

Plant Visitations Committee

Albert Hirsch

Chairman

seeing is believing with this new ACME Greaseless Composition



Just hold that handy tube against the wheel and Acme Greaseless Composition heads right up in a good heavy layer—dries almost immediately—with practically no composition wasted.

And you get a quality finish every time with this latest addition to the complete line of H-VW-M compositions. Whether you're cutting or polishing ferrous metals, deburring, or satin-finishing, you'll get the same excellent results—all due to the inflexible standards of H-VW-M quality control. Abrasive grading is rigidly controlled. Multiple separation and sifting of particles ensures all-over uniformity—a consistent size abrasive—and guarantees the finest finish possible.

Top-quality compositions are only one result of H-VW-M's constant progress for more than eighty years. It's a continuous policy, best summed up by the word Platemanship—your working guarantee of the best that industry has to offer, not only in compositions, but in every phase of plating and polishing. 8434

For technical information on buffing compositions ask for Bulletin C-100.

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practical products for practical people

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Brighter, more reliable quality nickel plating, easy to control, can be operated at higher speed, gives unbelievable uniformity in recesses with brighter, whiter color.

BRASS MAINTENANCE SOLUTION

Maintains required color for consistent results. Does not need frequent attention, makes brass plating easy and trouble free with high quality results.

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Nothing experimental about this line-up. All these products have been tried, proven and put into use in the best plating plants.

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Positive electric insulation for water, air, steam hydraulic or other pipe lines. Highest quality rubber hose with positive couplings at each end, to provide perfect protection. Sizes for all needs.

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ANNUAL REPORTS OF OFFICERS

of the

American Electroplaters' Society

PRESIDENT'S REPORT

MacStoker

As President of your Society, I would like to report to you, the membership, not too lengthily on the work of the Office and of the Executive Board, your elected officers of the Society.

The Board met in business session six times during the current A. E. S. year officially, and at other times some members of the Board met at various locales with Research Committee, Editorial Board and regional groups. There was also much correspondence between the members of the Board during the course of the year on many items of concern. The Board has sought to carry on the business of the Society in the best manner possible. It has not always been simple. At National Headquarters there have been some problems confronting us; a comparatively new home and location, new personnel, staff changes, and more in the making. It is obvious now that somewhat more space is required for handling of many things not formerly needed in major degree.

The work of the Research Committee has gone on as before but at a somewhat reduced tempo. Some projects of research are inactive at present because of lack of Fellows to man them, and some of the projects have been finished and committees discharged and results published or about to be. A complete report on these matters will be made by the Research Committee Chairman, Dr. Price.

The Editorial Board has during the year labored to procure and in some instances prepare suitable papers and articles for both our publication and convention. Increased importance and freedom to function fully has been recommended for Editorial Board activities.

The financial picture for the year has been a reasonably good one but not altogether satisfactory. We shall be much more than in the black but it is still annoying and unpleasant to note that it takes more than a little of the publication's earnings to support the Society's services.

In the field of education and lecture the Branches are making good use of the Speakers' List as prepared by the Educational Chairman and First Vice-President but they are also using the talents of many in the immediate locale to supplement their choice of interesting subjects to talk on for their Branch and Regional meetings.

On January 10 of this year at Columbus, Ohio, the Society held its second Interim Meeting, the first one being held last year at Philadelphia. About the same number of Branches and delegates were present as there were last year. It seemed, however, that there were more matters of concern to talk over and more general participation in discussion than there was last year and the full scheduled time of the Agenda was used and more. The meeting did not lag or become uninteresting. Sharp difference of opinion was had by the delegates and leading activists of the Society; criticism of our PLATING publication occurred and several recommendations to improve its status were made; a controversial one that suggested the payment of monies for technical and practical articles for publication in PLATING brought out much discussion and divergence in opinion. There did not seem to be a clean-cut cleavage of "Yes" or "No" on this question. Some of our leaders were not satisfied that payment for articles was the answer to an improved technical journal. The matter of broadening the scope of the Society's potential, both in practice and membership, was presented at this meeting. Facts and figures sustaining the advisability of initiating such a program were given, and while there did not seem to be any real opposition to this sort of promotion, neither did there seem to be any over enthusiasm. The trend has been for a decade at least to enhance and increase the sphere of influence and responsibility of the electroplater into the organic and electro-chemical treatments but also into the polishing and surfacing fields. The electroplater has accepted this in the past and will increasingly do so in the future.

Another matter that aroused considerable interest and provoked discussion was that of a suitable time of the year for the holding of our annual conventions and periodical Industrial Expositions. There seemed to be a substantial group of experienced convention goers who were critical of the hot weather periods (June to September) during which the A. E. S. holds its conventions and expositions and strongly urged that the Society look into seriously the matter of a cooler period of the year in which to hold our annual meetings and expositions. There were, however, a number of voices raised in opposition stating that this had been considered before and it was found that the disadvantages, perhaps, outnumbered the advantages. It seems to your President that this question is one that should be determined shortly, if at all possible, one way or another.

The membership status of the Society has been progressed. Our members have increased more than three hundred during the current membership and fiscal year; about 6 per cent increase. This is not a large percent increase but it is a substantial one and if maintained and given added impetus on the part of some of our branches, a desirable progressive status of membership numbers could be had within a relatively short period.

Credit and mention should be had for those individuals serving the Society on some of the inter-Society relations, such as Walter Pinner and Walter Meyer on the International Conference Committee to plan and regulate international meetings on plating and finishing; to Dr. Wesley, Dr. Wick, liaison to the Inter-Society Corrosion Committee of the Society of Corrosion Engineers and Walter Pinner again, as last year, serving as chairman of the Metal Finishing Industry Action Committee, concerned with plating room waste disposal, and I should like at this time to commend Clyde Kelly of the Finance Committee of the A. E. S. Research Committee with his associates, Ray Ledford, Henry Kellner, Robert Racine and others responsible for a successful year in procuring the necessary Sustaining Memberships with the resultant financial support necessary to carry on our research program. The $1.00 per year per A. E. S. member assessment, voted this year, will help materially in lessening the labor of this Committee yearly.

In conclusion, in taking my leave of the office of President of the Society, I have regrets that more could not be accomplished. I have felt a lack of personal achievement in meeting some of the problems that confront us. However, be such as it is, I am leaving the progress and administration of the Society in capable hands; the hands and hearts of my fellow members of the Executive Board at this time, who I am sure will serve you well in the years to come. My personal thanks to the servants of the Society, the Executive Secretary and his Headquarters staff, the members of the various committees, the activists in the many branches, who by their effort and devotion have enhanced and embellished the escutcheon of the A. E. S. and lastly, but not the least, my personal thanks to the membership of this Society who have so signally honored me as a member of the Executive Board for the last five years.

FRANKLYN J. MACSTOKER

FIRST VICE-PRESIDENT'S REPORT

Swift

The educational aspects of our Society have this past year embraced both internal and external education policies.

Internal education has progressed through a second successful Interim Meeting equally as successful as the first with evident favorable reactions to have these meetings a continuing function. It is through such meetings that our Supreme Society learns to function properly with an increased ability to work out the elements of progress within and without each and every Branch.

External education has progressed through the growing stage with graduation exercises held at the Chicago Amphitheater last June when our third Industrial Finishing Exposition was presented under adverse temperatures to an appreciative audience of spectators and prospective users.

The Executive Board has for some time considered furthering the quality and quantity of permanent bound volumes of the publications of the Society and is now ready to request for consideration that all technical papers presented at the Annual Meeting be published in PLATING as soon as possible after presentation. This is further amplified by including in an annual bound volume, similar to our present *Proceedings*, both the technical papers of the Convention and the technical articles appearing throughout the year in PLATING.

It is further hoped that an effective program of publishing bound volumes of the immediately effective values, resulting from the work carried out in the various Research Projects under the Supervision of the Research Committee, may be started soon.

Branch Librarians have become more appreciative of the importance of their office and have worked hard to obtain speakers on timely topics of interest to their particular locale. As usual, the various distributors have freely given the services of their technical men in all parts of the country. These speakers have all been appreciated and made welcome by Branch Officers or selected representatives before, during and after the formal meeting which is an improvement over some previous practices.

I am very appreciative of the many courtesies extended to me during the year by the Branches which were visited in connection with the carrying out of my duties as an aid to President MacStoker and the other members of the Executive Board. It has been a pleasure to work for you.

GEORGE P. SWIFT

Necrology

The following members have died during the year. Many of them contributed greatly to the advancement of the Society, which, with their Branches and friends, mourns their passing.

Baltimore-Washington Branch: Harris M. Lyen
Boston Branch: Louis Gale, Paul S. Lajer, Sylvester Pearsall
Bridgeport Branch: William Flaherty
Chicago Branch: R. V. Dawney, Ralph Fosnacht, Jacob Hay, J. J. Manderscheid, O. P. Watts, and F. A. Witt
Cincinnati Branch: Martin F. Gannon, Jr.
Dayton Branch: A. H. Hannon
Detroit Branch: Isadore E. Goodman, Charles H. Eldridge
Grand Rapids Branch: Clyde Craven, L. Keiser
Hartford Branch: Fred J. Lau, James J. O'Shea
Houston Branch: Nowery J. Smith
Indianapolis Branch: A. L. Chesterfield
Milwaukee Branch: Edward Meiers, Bernard Ritter, Sylvester Stroinski
Newark Branch: John P. Roos
New Haven Branch: John English, George G. Knecht
New York Branch: Stanley M. Goodis
Rochester Branch: Michael Andrews
Southeastern Branch: W. L. Fickling
Springfield Branch: Frank Clark
Sydney Branch: W. W. Patterson
Syracuse Branch: Russell O. Warner
Toronto Branch: John Walker
Member-at-Large: J. Van der Graaf

SECOND VICE-PRESIDENT'S REPORT

Schaefer

One of the main privileges and duties of the Second Vice-President is to encourage interest and expansion in our membership ranks. During the past year, the Society has continued to enjoy a small modest healthy growth having passed the 6,000 mark from 5,611 prior to the end of the calendar year. The actual statistics of membership by branches from April 1, 1952 to March 31, 1953 are tabulated in the membership table.

Perhaps the most significant observation from these data and prior years is the large number of members who are suspended during the year. Generally speaking, 6 to 8 per cent of our members are suspended each year while approximately 1 to 2 per cent resign in the same interval. The members who resign can be satisfactorily explained by change in position, location, sphere of interests, etc. However, the 6 to 8 per cent who are suspended as dissatisfied or disinterested members represent a challenge to us. They, your Vice-President believes, can be markedly reduced, if you, as Delegates, will help to initiate a specific plan in each Branch to resell and keep sold the membership benefits from the Society to this small but important contingent of our members. This re-education, since they were sold once or they would not have joined, can best be accomplished at Branch level because of intimate knowledge of the individuals. The overall program will undoubtedly vary in the several branches because of local circumstances, which are unknown at the Supreme Society level. If a few words or a letter would be passed on to the member early in his lack of interest period preferably by a Branch officer who knows the individual your Vice-President is sure that many a dissatisfied member would not be suspended but rather converted into an interested member. Remember that two former members are removed from our ranks for each three new members joining the Society. Let's try to sell the disgruntled member rather than suspend him in the future! As of March 31, 1953, 42 Branches of the 48 had increased their membership. The New York Branch led the first group of Branches (largest membership) with a net gain of 15.4 per cent, followed by the Cleveland Branch and the Milwaukee Branch with 11.3 per cent and 10.8 per cent, respectively. The Saginaw Valley Branch led the second group with 28.8 per cent gain, followed by Rochester and Syracuse with gains of 21.6 and 14.3 per cent, respectively. In the third group (smallest membership) the Louisville Branch led with a gain of 109.5 per cent, followed by Toledo with a 43.6 per cent gain and Allentown-Reading Branch with a 23.3 per cent gain.

The seeds planted in previous years were brought to maturity in March, 1953 with the granting of permanent charters to Wichita and Kansas City Branches, bringing the total A. E. S. active branches to 48. Recently, your Vice-President has been in contact with active and prospective members into two other western cities and it is hoped that their interest will crystallize into branches increasing the A.E.S. family even farther.

RALPH A. SCHAEFER

MEMBERSHIP REPORT

April 1, 1953

BRANCH	Membership April 1, 1952	Elected	Reinstated	Transferred In	Transferred Out	Resigned	Suspended	Died	Net Gain	Membership March 31, 1953
Adelaide	46	6	..	..	..	..	..	..	6	52
Allentown-Reading	43	11	..	..	..	..	1	..	10	53
Baltimore-Washington	92	8	1	8	1	1	5	1	1	93
Boston	147	13	1	..	..	5	..	1	8	155
Bridgeport	154	13	..	..	..	..	8	1	4	158
Buffalo	104	8	..	..	1	1	4	..	2	106
Chicago	464	75	5	4	7	3	55	6	13	477
Cincinnati	90	12	2	3	1	3	10	1	2	92
Cleveland	212	36	..	5	1	7	9	..	24	236
Columbus	56	7	1	..	1	6	4	1	− 4	52
Dallas-Fort Worth	52	8	..	1	..	8	..	..	1	53
Dayton	80	8	..	..	1	2	8	1	− 4	*76
Detroit	491	52	3	7	10	23	15	1	13	504
Grand Rapids	158	23	1	2	4	3	2	2	15	173
Hamilton	22	3	..	..	..	..	..	..	3	25
Hartford	148	13	..	1	1	8	..	2	3	151
Houston	39	13	..	..	2	1	7	..	3	42
Indianapolis	109	11	2	..	1	2	13	1	− 4	105
Jackson-Lansing	56	6	..	..	..	1	..	..	5	61
Kansas City*	....	38	..	8	..	..	..	..	46	46
Lancaster	64	7	..	..	1	..	1	..	5	69
Los Angeles	226	16	5	6	1	3	13	..	10	236
Louisville	21	25	..	1	..	2	..	1	23	44
Melbourne	170	20	1	..	..	4	28	..	− 1	169
Milwaukee	148	21	..	2	1	2	1	3	16	164
Montreal	72	9	..	1	..	2	..	..	8	80
Newark	249	19	1	1	4	3	10	2	2	251
New Haven	88	18	1	..	2	..	3	2	12	100
New York	305	60	1	4	4	2	11	1	47	352
Philadelphia	200	16	15	..	4	2	27	..	− 2	198
Pittsburgh	134	24	1	..	4	6	7	..	8	142
Providence-Attleboro	93	6	1	1	..	3	3	..	2	95
Rochester	88	22	..	..	..	2	..	1	19	107
Rockford	61	3	1	..	2	..	..	..	2	63
Saginaw Valley	80	23	..	1	1	..	..	..	23	103
St. Joseph Valley	73	8	1	1	..	..	5	..	5	78
St. Louis	101	8	..	..	..	..	..	..	8	109
San Francisco	68	11	..	..	..	..	5	..	6	74
Southeastern	47	13	4	..	..	..	13	1	3	50
Springfield	55	4	..	..	1	..	..	1	2	57
Sydney	85	5	3	..	..	1	9	1	− 3	82
Syracuse	112	25	4	1	1	4	8	1	16	128
Toledo	39	14	3	2	..	..	2	..	17	56
Toronto	132	16	..	..	1	..	..	1	14	146
Twin City	66	9	1	1	..	5	1	..	5	71
Waterbury	128	3	..	4	1	2	2	..	2	130
Western Ontario	18	8	..	1	..	1	4	..	4	22
Wichita*	....	40	..	1	..	..	..	..	41	41
At Large	125	30	..	3	2	2	15	1	13	138
Total	5,611	554	59	65	61	120	309	34	454	6,065

*Out of Competition

AUDITOR'S REPORT

AMERICAN ELECTROPLATERS' SOCIETY
445 BROAD STREET
NEWARK 2, N. J.

We have examined the balance sheets of the General Fund and Research Fund of the American Electroplaters' Society (New Jersey Corporation) as of March 31, 1953, and the related statements of income and funds for the year then ended. Our examination was made in accordance with generally accepted auditing standards, and accordingly included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances, with the exception that we did not confirm the accounts receivable.

The accompanying balance sheets and statements of income are exclusive of certain accounts described in the notes appended thereto.

In our opinion, the accompanying balance sheets and statements of income, except as indicated above, present fairly the financial position of American Electroplaters' Society at March 31, 1953, and the results of its operations for the year then ended, in conformity with generally accepted accounting principles applied on a basis consistent with that of the preceding year.

CLYDE A. ZUKSWERT & CO.
Certified Public Accountants

Newark, N. J.
April 22, 1953

FINANCIAL STATEMENT OF THE SUPREME SOCIETY OF THE AMERICAN ELECTROPLATERS' SOCIETY, INC.

General Fund

BALANCE SHEETS, MARCH 31, 1953 AND 1952, AND COMPARISON

	March 31 1953	March 31 1952	Increase Decrease*
ASSETS			
Current Assets:			
Demand deposits:			
Jenkintown Bank & Trust Company, Jenkintown, Pa.	$	$ 37,658.98	$ 37,658.98*
Fidelity Union Trust Company (North Ward Branch), Newark, N. J.	$ 56,102.05	$	$ 56,102.05
Petty cash	$ 70.00	$ 40.00	$ 30.00
United States Treasury bond, Series K	$ 10,000.00	$	$ 10,000.00
Time deposits:			
American National Building & Loan Association, Baltimore, Md.	$ 5,000.00	$ 5,000.00	$
Atlanta Federal Savings and Loan Association, Atlanta, Ga.	5,000.00	5,000.00	
Augusta Building & Loan Association, Baltimore, Md.	5,000.00	5,000.00	
Aurora Federal Savings and Loan Association, Baltimore, Md.	5,000.00	5,000.00	
East Girard Savings & Loan Association, Philadelphia, Pa.	10,000.00		10,000.00
Fidelity Federal Savings and Loan Association, Glendale, Calif.	5,000.00	5,000.00	
Hatboro Federal Savings & Loan Association, Hatboro, Pa.	5,000.00		5,000.00

THIRD VICE-PRESIDENT'S REPORT

Kelly

Your Third Vice-President has attended the monthly and annual meetings of many Branches during the past year and he has had the pleasure of serving as Honorary Chairman at some of these meetings. It has been quite pleasant to see the variety and timeliness of the programs which have been presented.

As my term as Third Vice-President closes, I also end my three years of service on the Research Committee. During these three years my task has been the necessary one of raising funds for the Research Program. I am happy to report that with the help of a great many sincere and hard-working people, a marked improvement was made in the financial condition of Research Fund.

During the past year I have attended all of the meetings of the Executive Board, I have entered into the Board's discussions, and contributed ideas which I felt would promote the progress and prestige of the Society.

I am very grateful for the suggestions I have received from other members of our Society during the past year—ideas which were contributed with the intention of making the Society more useful to the members. Like the other officers, I solicit the expression of your views in order that I may better serve you.

CLYDE KELLY

PAST PRESIDENT'S REPORT

Nixon

I am grateful to the Supreme Society for the opportunity given me to serve on the Society's Executive Board for the

past five years. I know that I have learned a great deal not only of the technical details of Society operation but also, and more important, of the wonderful willingness of our people to be helpful even though a considerable sacrifice in time and money may be involved. At no time, in my experience on the Board, did anyone refuse an assignment.

Since my election to the office of Third Vice-President in that big but close room in Atlantic City's Exposition Hall in 1948, the number of Society Branches has increased from 42 to 48. The number of members has increased from 4,898 to 6,065. The Society's assets, not including the Research Fund, have increased from a little under $60,000 to over $150,000. In other ways less easy to label, our Society has grown. And as long as we continue to give capable people an opportunity to help, as long as we continue "to sell ourselves to ourselves", there is reason to expect continued growth; the attainment of our membership goal, 10,000 members, is not many years removed.

In dealing with the many problems that have come to the Executive Board and to the Supreme Society, I have observed that agreement is easy when there is no difference of opinion. I have also observed where a difference in thinking exists that a patient search will usually turn up an acceptable compromise better than either first-proposed alternative. This, I believe, is democracy in action.

It is with regret that I drop away from the Executive Board activity. It gets in the blood. I hope, however, to be useful to the Society in other ways for many years to come.

C. F. Nixon

EXECUTIVE SECRETARY'S REPORT

Foulke

Income and Expenditures

The Financial Statement following this report clearly depicts the condition of the Society with respect to the General Fund, the Research Fund and special funds. The picture is a good one, but it should again be pointed out that income from

Home Building and Loan Association, Los Angeles, Calif.	5,151.13	5,000.00	151.13
Occident Federal Savings and Loan Association, Baltimore, Md.	5,000.00	5,000.00	
Peoples Federal Savings and Loan Association, Detroit, Mich.	5,000.00	5,000.00	
Progress Federal Savings and Loan Association, Baltimore, Md.	5,000.00	5,000.00	
Standard Savings and Loan Association, Baltimore, Md.	5,000.00	5,000.00	
Standard Savings and Loan Association, Detroit, Mich.	5,100.50	5,000.00	100.50
Suffolk County Federal Savings and Loan Association, Babylon, N. Y.	5,151.12	5,000.00	151.12
Surety Savings and Loan Association, Detroit, Mich.	5,000.00	5,000.00	
Total time deposits	$ 80,402.75	$ 65,000.00	$ 15,402.75
Accounts Receivable:			
Advertising, books and reprints	$ 5,830.77	$ 11,439.56	$ 5,608.79*
Members at large		860.44	860.44*
Per capita tax	353.38		353.38
Branch supplies	64.30	44.80	19.50
Suppliers	32.23		32.23
Total accounts receivable	$ 6,280.68	$ 12,344.80	$ 6,064.12*
Advance to Industrial Finishing Exposition Committee:			
Chicago	$	$ 9,000.00	$ 9,000.00*
Cleveland	1,032.91		1,032.91
Total current assets	$153,888.39	$124,043.78	$ 29,844.61
Deposits:			
Bell Telephone Company	$	$ 200.00	$ 200.00*
Copyright Office	28.00	34.00	6.00*
American Airlines	425.00	425.00	
Total deposits	$ 453.00	$ 659.00	$ 206.00*
Carl E. Heussner Award Fund:			
Fidelity Federal Savings and Loan Association, Glendale, Calif.	$ 3,000.00		$ 3,000.00
Total assets	$157,341.39	$124,702.78	$ 32,638.61

LIABILITIES AND FUND

Current Liabilities:			
Payroll tax deductions	$ 405.96	$ 543.28	$ 137.32*
Advertising advance payments	2,362.00	1,843.11	518.89
Per capita tax advances	79.03		79.03
Foreign advances	26.57	38.02	11.45*
Research Fund	31.95		31.95
Total current liabilities	$ 2,905.51	$ 2,424.41	$ 481.10

Unexpended Appropriations of Funds:			
Convention account—Exhibit D	$ 461.66	$ 2,170.85	$ 1,709.19*
Industrial Finishing Exposition account —Exhibit D		3,740.96	3,740.96*
Total unexpended appropriations	$ 461.66	$ 5,911.81	$ 5,450.15*
Carl E. Heussner Award Fund	$ 3,056.16	$ 3,125.00	$ 68.84*
General Fund, per Exhibit C	$150,918.06	$113,241.56	$ 37,676.50
Total liabilities and fund	$157,341.39	$124,702.78	$ 32,638.61

NOTES:

1. The above Balance Sheets do not include inventories of publications, literature and supplies, office furniture and equipment, accounts payable and prepaid and accrued expenses.
2. The Balance Sheet as of March 31, 1952 has been prepared from auditor's report submitted by Laurence E. Brown Company, Certified Public Accountants.

General Fund

STATEMENT OF INCOME FOR THE YEARS ENDED MARCH 31, 1953 AND 1952, AND COMPARISON

	Year Ended March 31— 1953	1952	Increase Decrease*
SOCIETY ACCOUNT			
INCOME:			
Sales:			
"Proceedings"	$ 1,599.97	$ 929.01	$ 670.96
Books and reprints	1,201.36	1,679.83	478.47*
Glasstone book	112.70	112.12	.58
Branch supplies	144.40	72.80	71.60
Total sales	$ 3,058.43	$ 2,793.76	$ 264.67
Per capita tax (Pro rata share)	16,524.67	14,993.55	1,531.12
Member-at-large dues (Pro rata share)	369.83	684.80	314.97*
Interest on investments	1,890.88	1,803.03	87.85
Miscellaneous income	51.59	268.51	216.92*
Income	$ 21,895.40	$ 20,543.65	$ 1,351.75
EXPENSES:			
"Proceedings" expense	$ 11,893.21	$ 5,400.21	$ 6,493.00
Books and reprints purchased	1,147.18	1,290.45	143.27*
Glasstone book royalties	9.00	9.80	.80*
Branch supplies purchased	132.82	92.05	40.77
Salaries (Pro rata share)	9,639.65	15,403.07	5,763.42*
Traveling expense:			
Executive secretary (Pro rata share)	1,434.54	1,522.72	88.18*
Officers (Pro rata share)	1,347.33	1,866.30	518.97*
Officers' office expense	103.91	55.11	48.80
Furniture and fixtures and office equipment (Pro rata share)	474.83	705.28	230.45*

PLATING would have been necessary to defray the costs of operation of the Society, even though the budget was set up this year on a more realistic basis, had there been no Industrial Finishing Exposition profit. The deficit in the Society account this year, ignoring the Industrial Finishing Exposition income, amounted to $8,803.45 as calculated from the auditor's report, in spite of a very considerable effort on the part of your Executive Secretary to keep expenses at a minimum. Our bank account at the end of the year was $56,102.05 which is well over the maximum demand deposit required and points to the fact that additional investments must be made over and above the $25,000 invested during the past year.

BRANCH ACTIVITIES

For the second consecutive year two new branches have received permanent charters. Dr. George P. Swift presented Wichita Branch with its charter on March 24 and two days later did the same for the Kansas City Branch to bring the total number of A. E. S. Branches to forty-eight and the total membership to over six thousand.

The extent of branch activities may be judged by the number of Branch news items published in PLATING. These totaled *240* or *5* items for each of the forty-six permanent branches, and it might be noted that the items were on the average considerably longer this year, reflecting greater interest. Seventeen photos were supplied by the branches as well as several line drawings for reproduction. A total of 19 announcements of special Branch Meetings were published.

PUBLICATIONS

The print order for the April 1953 issue of PLATING was 8,000, the distribution being as follows:

Members:	
Active and Sustaining	6,204
Subscribers	1,014
Advertising and Exchange	523
Inventory	259

A small decrease in subscribers (45) occurred during the year, but again no effort was made to promote the sale of subscriptions. The fact that 87 more pages of advertising were carried this year than last year not only emphasizes the fact that PLATING is becoming a more and more important factor to the metal finishing industry, but also shows that Walter Dietrich is doing a good job in pointing out to advertisers the growing importance of PLATING.

The PROCEEDINGS of the business sessions of the 1952 Convention were published promptly, but again illness of one of the editors of the technical session PROCEEDINGS delayed publication of this volume and made it necessary for the Ex-

ecutive Secretary to take over a considerable portion of the editing in order to make possible the release of the PROCEEDINGS in January.

The total cost of the PROCEEDINGS this year was $1.93 per member and $1.88 per copy. This is slightly higher than last year but the book was larger in that the Constitution was included upon instructions from the Executive Board.

EDITORIAL BOARD

The Editorial Board took an increased stature during the year as the result of action taken at the Chicago Convention and at the last Interim Meeting it was suggested that the Board make recommendations specifically as to whether authors of articles in PLATING should be paid. The Society owes this group of men a vote of thanks for the effort put in by the members of the Editorial Board in trying to provide good convention papers and good copy for PLATING.

HEADQUARTERS

This marks a year in the offices in Newark, a year of adjustment during which personnel had to be found, new equipment procured and a host of details resulting from the move had to be looked after.

When we took over the office space in Newark it was realized that little, if any, additional room was provided. It was thought, however, that the greater efficiency resulting from one-floor operations would help and it was known that additional office space could be obtained in the same building. With an increasing membership and added services, a step will have to be taken in the near future to expand both the staff and the office space. With respect to the former we have six girls working for us now, two on a part-time basis, as compared to five full-time employees in Jenkintown. We might add that part of the time we operated with five (two part-time) employees because of the tight labor market in Newark.

Gus Soderberg's decision to return to Sweden threw a real burden upon your Executive Secretary last May and June. However, our new editor, Al Korbelak, stepped into the breach to keep PLATING coming out the first day of each month since July. He has done a good job and is deserving of recognition as is our production manager, Miss Mary Dickinson and all the staff, headed up by Miss Van Riper, whom many of you met at the PLATING booth in Chicago.

In this my second and final annual report, I want to thank the Executive Board for their understanding of the problems at Headquarters and also to express appreciation to the many members for their cooperation during the past year.

D. GARDNER FOULKE

Headquarters' office expense (Pro rata share)	3,134.21	2,461.63	672.58
Moving expense	600.00		600.00
New educational activities	1,957.86	1,389.04	568.82
Total expenses (Note 1)	$ 31,874.54	$ 30,195.66	$ 1,678.88
Excess of Income Over Expenses or Excess of Expenses Over Income (*)	$ 9,979.14*	$ 9,652.01*	$ 327.13
OTHER INCOME:			
Industrial Finishing Exposition income	$ 12,870.35		
Chicago Convention income	1,175.69		
EXCESS OF INCOME OVER EXPENSES OR EXCESS OF EXPENSES OVER INCOME (*) TRANSFERRED TO GENERAL FUND	$ 4,066.90	$ 9,652.01*	$ 13,718.91

PUBLICATION ACCOUNT

INCOME:			
Advertising	$140,170.69	$124,263.45	$ 15,907.24
Less:			
Discounts allowed	$ 2,394.14	$ 1,782.39	$ 611.75
Agency commission	19,979.48	15,680.09	4,299.39
Total	$ 22,373.62	$ 17,462.48	$ 4,911.14
Net	$117,797.07	$106,800.97	$ 10,996.10
Sales:			
Monthly publication	5,003.43	4,924.12	79.31
Per capita tax (Pro rata share)	12,263.95	11,127.62	1,136.33
Foreign membership dues (Pro rata share)	221.89	410.88	188.99*
Bad debts collected		25.87	25.87*
Total income	$135,286.34	$123,289.26	$ 11,997.08
EXPENSES:			
Commission, advertising manager	$ 18,063.67	$ 10,505.47	$ 7,558.20
Monthly publication expense	57,167.58	48,340.04	8,827.54
Furniture and fixtures and office equipment (Pro rata share)	474.82		474.82
Promotional advertising expense	1,009.84		1,009.84
Salaries (Pro rata share)	20,169.42	16,031.77	4,137.65
Traveling expense:			
Executive secretary (Pro rata share)	448.30		448.30
Advertising manager		2,948.08	2,948.08*
Editor and assistant editor	755.51	339.32	416.19
Officers (Pro rata share)	735.09		735.09
Copyright expense	56.00	48.00	8.00
Uncollectible accounts		234.83	234.83*
Headquarters' office expense (Pro rata share)	7,836.05	6,206.07	1,629.98
Total expenses (Note 1)	$106,716.28	$ 84,653.58	$ 22,062.70
Excess of Income Over Expenses Transferred to General Fund	$ 28,570.06	$ 38,635.68	$ 10,065.62*

SUMMARY

	Society Account	*Publication Account*	*Total*
Total income	$ 35,941.44	$135,286.34	$171,227.78
Total expenses	31,874.54	106,716.28	138,590.82
Excess transferred to General Fund	$ 4,066.90	$ 28,570.06	$ 32,636.96

NOTES:

1. The expenses reported do not take into account the changes during the period in inventories of publication, literature and supplies, office furniture and equipment, accounts payable and prepaid and accrued expenses.
2. The Statement of Income for the year ended March 31, 1952 has been prepared from auditor's report submitted by Laurence E. Brown Company, Certified Public Accountants.

General Fund

STATEMENT OF GENERAL FUND ACCOUNT
FOR THE YEAR ENDED MARCH 31, 1953

Balance, April 1, 1952		$113,241.56
Add:		
Industrial Finishing Exposition:		
Refund of expenses	$ 5,347.20	
Cancellation of appropriation balance	3,740.96	9,088.16
Excess of income over expenditures for the year ended March 31, 1953, per Exhibit B		32,636.96
Total		$154,966.68
Deduct:		
Traveling expenses applicable to and not accrued for prior year	$ 521.69	
Write off of difference between control account of accounts receivable and detail at March 31, 1952	326.38	
Proceedings expense applicable to year ended March 31, 1952, per Executive Secretary's report for that year	3,200.55	
Total deductions		4,048.62
Balance, March 31, 1953		$150,918.06

General Fund

STATEMENT OF RECEIPTS AND DISBURSEMENTS OF APPROPRIATED FUND ACCOUNTS FOR THE YEAR ENDED MARCH 31, 1953

CONVENTION ACCOUNT

April 1, 1952, Unexpended Balance of Convention Profits Appropriated from General Fund	$ 2,170.85
RECEIPTS:	
Refund of Society expenses, Chicago Convention	1,261.81
Total	$ 3,432.66

RESEARCH COMMITTEE CHAIRMAN'S REPORT

Price

As will be seen from the Auditor's Report published elsewhere in this issue, the financial condition of the Research Committee is greatly improved over last year. Last year's report showed an excess of nearly $10,000. This year, the Research Committee has a surplus of $17,441.84. Vice-Chairman Finance, Clyde Kelly, Co-Chairman Ray Ledford and their co-workers are to be congratulated upon the splendid job they have done in helping to bring this about.

During the year under review, an A. E. S. Research publication appeared in every issue of PLATING. These publications covered work done under Projects 2, 5, 8, 9, and 10, and included the comprehensive paper from Project 9 on physical properties of nickel deposits. This paper, which reports four years of work under the said project, appeared in the August, 1952 issue of PLATING. In addition, the Editor of PLATING has five research reports on hand to be published in future issues. Three research reprints were also published during the year and two more are in preparation.

It was reported last year that the Research Committee had adopted a new procedure for selecting research projects. It consists in setting up a Task Committee of experts in the field concerned to study the project, define, and, if necessary, to limit its scope and to suggest methods of attack. In this way, the Research Committee before setting up a new project gets advice, from the men in the best position to know, on whether the project comes within the scope of the Research Committee and is of real value to the electroplating industry. Four such Task Committees are now active and studying possible projects for the Research Committee.

In last year's report, attention was called to the scarcity of students available to accept Fellowships for work on A. E. S. Projects. The situation is becoming more serious as time goes on; every organization that employs technical men is suffering from it. The shortgage of students in engineering and other technical fields has been explained in various ways. The low birth rate in the early 1930's, the confusion occasioned by the lack of a clear-cut policy on the part of

RESEARCH SUBSCRIPTIONS

Branch Contributions	
Baltimore-Washington	$178.50
Chicago	441.00
Columbus	54.00
Detroit	500.00
Grand Rapids	435.00
Jackson-Lansing	100.00
Philadelphia	200.00
Pittsburgh	125.00
Providence-Attleboro	99.50
St. Joseph Valley	72.00
Twin City	25.00

the Defense Department with regard to the deferment of technical men and the tremendous expansion of industrial as well as government-sponsored research have all been put forward to explain the shortage. Suffice it to say, that fellowships, for which there would have been active competition a few years ago, go begging today.

As a result of this situation several of our Research Projects, upon which work is incomplete, are inactive, at least temporarily, due to our inability to secure Fellows to work on them. Your Research Committee has taken various steps to attract likely students with only partial success. The Vice-Chairman Research has prepared a letter to be sent out to the colleges of the country along with a poster to be put on the Bulletin Board calling attention to the A. E. S. Fellowships and to the advantages to be gained from work in the field of electroplating. It is suggested that some of the sons of A. E. S. members might wish to take advantage of the fellowships.

Your Chairman would like to stress the seriousness of the foregoing situation for the electroplating industry as a whole. Unless fundamental work in electroplating is continuously carried on and unless able young men can be persuaded to enter the field of electroplating, the healthy growth of our industry will come to an end and the progress of electroplating, in which the A. E. S. has always taken the lead, will cease. Your Chairman urges every member of the Society to do his best to interest intelligent young men in electroplating and to call their attention to the Society's Research Fellowships which permit them to obtain a college degree while carrying on research work in the electroplating field.

Donald M. Price

DISBURSEMENTS:

Chicago Convention:			
Printing and mailing of letters, rate schedules, etc.	$ 523.38		
Programs, including cuts and postage	674.43		
Travel expenses	64.00	$ 1,261.81	
Philadelphia Convention:			
Advance	$ 1,500.00		
Postage, express and office expense	209.19	1,709.19	
Total disbursements			2,971.00
March 31, 1953, Unexpended Balance			$ 461.66

INDUSTRIAL FINISHING EXPOSITION ACCOUNT

April 1, 1952, Unexpended Balance of Funds Appropriated from General Account	$ 3,740.96
Deduct:	
Unexpended balance returned to General Account	3,740.96

Research Fund

BALANCE SHEETS, MARCH 31, 1953 AND 1952, AND COMPARISON

ASSETS

Demand Deposits:			
Abington Bank & Trust Company, Abington, Pa.	$	$ 6,836.55	$ 6,836.55*
Lincoln National Bank, Newark, N. J.	$ 24,127.26	$	$ 24,127.26
United States Treasury 2% Bonds due 9-15-53	$ 5,000.00	$ 5,000.00	$
Time Deposits:			
Atlantic Federal Savings and Loan Association, Baltimore, Md.	$ 5,000.00	$ 5,000.00	$
Baltimore Federal Savings and Loan Association, Baltimore, Md.	5,000.00	5,000.00	
Liberty Federal Savings and Loan Association, Baltimore, Md.	5,000.00	5,000.00	
Loyola Federal Savings and Loan Association, Baltimore, Md.	5,151.13	5,000.00	151.13
Total time deposits	$ 20,151.13	$ 20,000.00	$ 151.13
Total assets	$ 49,278.39	$ 31,836.55	$ 17,441.84
FUND			
Research Fund, per Exhibit F	$ 49,278.39	$ 31,836.55	$ 17,441.84

Note: The Balance Sheet as of March 31, 1952 has been prepared from auditor's report submitted by Laurence E. Brown Company, Certified Public Accountants.

Research Fund

STATEMENT OF INCOME AND RESEARCH FUND ACCOUNT FOR THE YEARS ENDED MARCH 31, 1953 AND 1952, AND COMPARISON

	Year Ended March 31		Increase Decrease*
	1953	1952	
INCOME:			
Sustaining membership dues and subscriptions	$ 31,231.50	$ 31,418.00	$ 186.50*
Sale of reprints	2,880.90	260.30	2,620.60
Interest on investments	701.13	807.38	106.25*
Miscellaneous income	1,423.50		1,423.50
Total income	$ 36,237.03	$ 32,485.68	$ 3,751.35
EXPENSES:			
Transfer to Research project number 15	$ 3,000.00	$	$ 3,000.00
Transfer to Canadian Research Fund		2,000.00	2,000.00*
Project payments to institutions	3,300.00	7,125.00	3,825.00*
Salaries of project directors and associates	7,608.92	27,614.20	20,005.28*
Cost of reprints	2,792.51	584.92	2,207.59
Supplies	56.39	572.99	516.60*
Office expense	82.53	21.50	61.03
Per capita tax, sustaining members paid to General Fund	1,377.10	1,254.90	122.20
Social security tax	28.20	194.05	165.85*
Travel expense	206.93	302.20	95.27*
Bad debts		8.61	8.61*
Miscellaneous expense	342.61	2,390.07	2,047.46*
Total expenses	$ 18,795.19	$ 42,068.44	$ 23,273.25*
Excess of Income Over Expenses or Excess of Expenses Over Income (*)	$ 17,441.84	$ 9,582.76*	$ 27,024.60
Research Fund:			
Balance, April 1	31,836.55	41,419.31	9,582.76*
Balance, March 31	$ 49,278.39	$ 31,836.55	$ 17,441.84

NOTE: The Statement of Income for the year ended March 31, 1952 has been prepared from auditor's report submitted by Laurence E. Brown Company, Certified Public Accountants.

Statement of Canadian Research Fund

FOR THE YEAR ENDED MARCH 31, 1953

ASSETS		
Cash, Dominion Bank, Toronto, Canada		$ 941.64
FUND		
Balance, April 1, 1952	$ 149.69	
Sustaining membership dues	$ 800.00	
Less exchange, etc.	8.67	791.33
Interest received	.62	
Balance, March 31, 1953		$ 941.64

LAW COMMITTEE CHAIRMAN'S REPORT

Since its last Annual Report your Committee has been augmented and elevated in prestige and efficiency by the addition to its numbers of William J. Neill, Columbus Branch, and Myron B. Diggin, Newark Branch. During the year this enlarged Committee has:

Reviewed proposed by-law revisions of Allentown-Reading and Philadelphia branches, both of which drafts were found in order.

Reviewed and approved for presentation the drafts of amendments prepared for the Chicago and Philadelphia conventions for mail ballot.

Assisted in the preparation of resolutions for the Chicago Convention.

Drafted notes for the formulation and revision of Branch by-laws, with a specimen set meeting minimum requirements.

Abstracted from PROCEEDINGS of past conventions, 1938–1951, certain significant rulings and precedents having present force, relating to advertising in Branch affairs, Branch representation, seating of Delegates, eligibility for office in the Supreme Society, the number (two) of Honorary Members who may be elected in one year, and the time limit (none) for consideration of nominations for Honorary Membership.

MANSON GLOVER

SUSTAINING MEMBERSHIP LIST

As of April, 1953

(Figures in parenthesis indicate number of memberships held)

Accurate Electro-Plating, Inc.
Accurate Engineering Laboratories
Acme Galvanizing, Inc.
Acme Plating Company, The
Acme Steel Company
Adolph Plating, Inc.
Advance Plating Company, The
Aetna Electroplating Company
Alert Supply Company
Allen-Bradley Company
Allied Industrial Products, Inc.
Allied Research Products, Inc.
Alsop Engineering Corporation
Aluminum Company of America
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(Continued on page 676)

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RESEARCH PROJECTS

Project No.	Location	Project Director	Committee Chairman	Fellow	Subject	Remarks	Year Accepted
2	Lehigh University	E. J. Serfass	W. Meyer	R. F. Muraca	Analytical Methods	Reactivated. ORSANCO Project closed	1944
5	Michigan State College	D. T. Ewing	L. Borchert	W. Dow	Effect and Removal of Impurities	Project progressing normally, Al study started, Cr and Pb papers finished	1945
10	Yale University	B. Dodge	O. Stocker	None	Control of metal finishing wastes	Active. Dr. Dodge studying economic aspects	1947
12	Columbia University	H. Linford	E. T. Candee	D. O. Feder	Cleaning	Active. Equipment constructed. Work on oxide coatings proceeding	1948
13	National Bureau of Standards	F. Ogburn	C. Sample	None	Porosity	Inactive. No Fellow	1950
14	Ontario Research Foundation	A. E. R. Westman	W. M. Tucker	F. A. Mohrnhein	Influence of Physical Metallurgy and Mechanical Processing of Basis Metal on Electroplating	Active literature survey and bibliograph in. Experimental work started	1951
15	Houdaille-Hershey Corp.	None	W. L. Pinner	None needed as yet	Corrosion Tests	Active. Duties of committee members assigned. Produce and test 4,000 plates	1952

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American Hot Dip Galvanizers Association, Inc.
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Article Abstracts

No copies of articles are available at the offices of "Plating". Photostats may be had from libraries having files of the journal in question and offering photostat service, usually at 30-50 cents a page. Ask your public library to consult the Union List for names of libraries having the particular journal. Abbreviations used are those of Chemical Abstracts.

An Electrolyte for Electropolishing and Electroetching. E. Knuth-Winterfeldt. Jernkontorets Annaler **134**, 538–539 (1950).

Particulars on a new improved electrolyte for electropolishing and etching. Composition of electrolyte. Results obtained on steel, especially low carbon steel, gray iron, and various aluminum alloys as against results obtainable with the known electrolyte compositions. Voltage, current density, and useful electrolyte life.—HENRY BRUTCHER.

Production of Chromized Layers on Steel. H. Bennek, W. Koch and W. Tofaute. Stahl Und Eisen **64** (1944).

Preconditions for a sound chromized case on steel. Chromizing by salt bath process and chromizing in gaseous phase. Salt bath process: Modification of concentration by mixing with chlorides of the alkaline earths. Optimum conditions as function of temperature and rate of diffusion of chromium. Case thickness increased by various alloy elements in base metal or by changing the bath composition (modification of $CrCl_3/CrCl_2$ ratio or addition of vanadous chloride). Gas Chromizing: Concentration as function of miscibility and partial pressure of gases. Suitable muffle material. Conditions of pressure. Advantages of gas chromizing: Recovery of waste chromium salts; economical use of gas carriers; high quality of case; production of chromium chloride directly from chromium ores. Comparative corrosion tests on chromized steel, 18–8 steel and 17 per cent Cr stainless steel in different acids. Effect of Mn, Cr, and Ti on carbon content of case and on case structure. Data on composition of steels suitable for chromizing.—HENRY BRUTCHER.

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Article Abstracts

Polishing and Bond Finishing. L. Marble. Metal Industry **82**, 206 and 244 (1953).

The organization of the polishing department is discussed and typical equipment is illustrated. The layout of barrel finishing departments is discussed along with different types of plating barrels and their usefulness. The author recommends the elliptical, off-center barrel which revolves the work in the form of a figure "8" for finishing. Media and speeds are suggested for certain applications.

On the Effect of Aluminum in the Anodizing Solution. T. Kobayasi and J. Inazaki. Light Metals (Japan) **1**, 51–56 (1951).

The authors have studied the effect of an increasing concentration of aluminum ions in the sulfuric acid anodizing bath on the thickness, hardness and corrosion resistance of the oxide films. The presence of aluminum ions was found to reduce the throwing power of the bath. Their effect was relatively more marked the lower the sulfuric acid concentration of the bath.

Influence of Prior Strain History on the Tensile Properties and Structures of High-Purity Copper. William D. Jenkins and Thomas G. Digges, J. Research NBS **49**, 167 (1952).

A study of the effect of prior strain history on the room-temperature tensile properties and microstructure of high-purity copper is reported. Tensile tests were made on oxygen-free high-conductivity (OFHC) copper initially as annealed, as cold-drawn different amounts, and as prestrained at 110°, 250°, and 300° F. The results show that the strength, ductility, and hardness of the copper are markedly affected by its prior strain history.

The microstructures of the tensile specimens were, in general, consistent with previous assumptions that cracks of a transcrystalline nature, and substructures, are nucleated during the second stage of creep, and that these phenomena are associated with prestraining at

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low temperatures and fast strain rates. Cracks thus nucleated grew to microscopic dimensions during the tensile tests. Prestraining at elevated temperatures and slow strain rates tended to result in fractures of a less ductile type and in cracks of an intercrystalline nature.

Silver Plating of Aluminum Surfaces for Electrical Contacts. P. J. Connor and W. R. Wilson. Paper presented at Annual Convention of American Institute of Electrical Engineers, New York, January 21, 1953. Abridged in American Metal Market, January 22, 1953. Light Metals Bul. **15**, p. 199 (March 20, 1953).

The authors of the (U. S.) General Electric Company dealt with the various advantages arising from the silver plating of aluminum surfaces to be connected together or to copper. The silver coating is applied electrolytically after the chemical deposition of a zinc coating on the aluminum surface to be plated.

Silver plating eliminates the need for the careful preparation of aluminum contact surfaces by abrasion under a layer of grease to remove the oxide film. High temperature and temperature-cycle tests have confirmed that silver plating prevented any increase in resistance from oxidation in the joints. In aluminum to copper joints, silver plating of the aluminum does not introduce any new corrosion problems.

Information Sheet No. 9. "Perchloric Acid and Perchlorates—Precautions in Use. Literature Review". (C. R. Taylor), January, 1953.

The Information Sheet has been prepared by Defence Research Laboratories (Private Bag No. 4, Post Office, Ascot Vale, W. 2, Victoria, Australia).

Hazards in using perchloric acid and perchlorates are stated with reference to the use of the acid in metallurgical analysis, also in electrolytic polishing of metals and use of magnesium perchlorate as a drying agent for gases. Safety precautions observed in handling such chemicals are described. The review has been compiled in order that the information should be readily available to laboratories and works using these chemicals.

Information Sheets are usually prepared to answer

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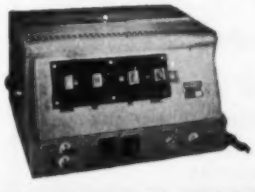

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specific inquiries addressed to D. R. L. and are sent only on request to persons having a definite need for the information. D. R. L. cannot undertake to supply lists or complete sets of Information Sheets or to send copies automatically as issued".—A. E. Dawkins.

Special Chromium Plating Baths. J. Salauze; Galvano **22**, 13–18 (March, 1953).

Hydrofluoric or fluosilicic acid (or suitable salts) when used instead of the usual sulfuric acid catalyst give higher current efficiencies, better throwing and covering power, but lower bath stability requiring frequent analysis. Simultaneous use of sulfate and fluosilicate catalysts combine the advantages of both bath types especially if the bath is "self-regulating", that is, when the catalyst anions are supplied from an excess of suitable salts having just the right solubilities in the bath to maintain proper catalyst concentrations.

Another special type of chromium plating bath was proposed by Bornhauser. It allows high plating speeds and is said to be especially suitable for plating on zinc. It is best made up from chromic acid 400 g/l, sodium hydroxide 58 g/l, sulfuric acid 0.75 g/l. Operating temperatures: 60–72° F; minimum bath voltage: 12 volts; current densities: 180–840 amp per sq ft; current efficiencies: 30–33 per cent.

For plating on zinc it is recommended to predip in a 0.1 to 0.5 per cent solution of ferric chloride. Final buffing is required.—Otto Kardos.

Composite Electrodeposit, Anon., Galvano **22**, 19 (March, 1953).

A composite coating of lead (from a fluoborate bath), a nickel-cobalt alloy and finally a chromium deposit was developed in Australia and adopted by the Royal Australian Navy. It has good salt water resistance, ductility and adhesion.—Otto Kardos.

The Painting of Steel. J. C. Hudson, Trans. Inst. Met. Finishing, 1953, **29**, Advance Copy No. 1.

The present state of knowledge of the protective painting of structural steel is reviewed. Existing methods, if properly applied, should prove satisfactory for most normal purposes. Possible developments in protective painting are discussed and suggestions are made

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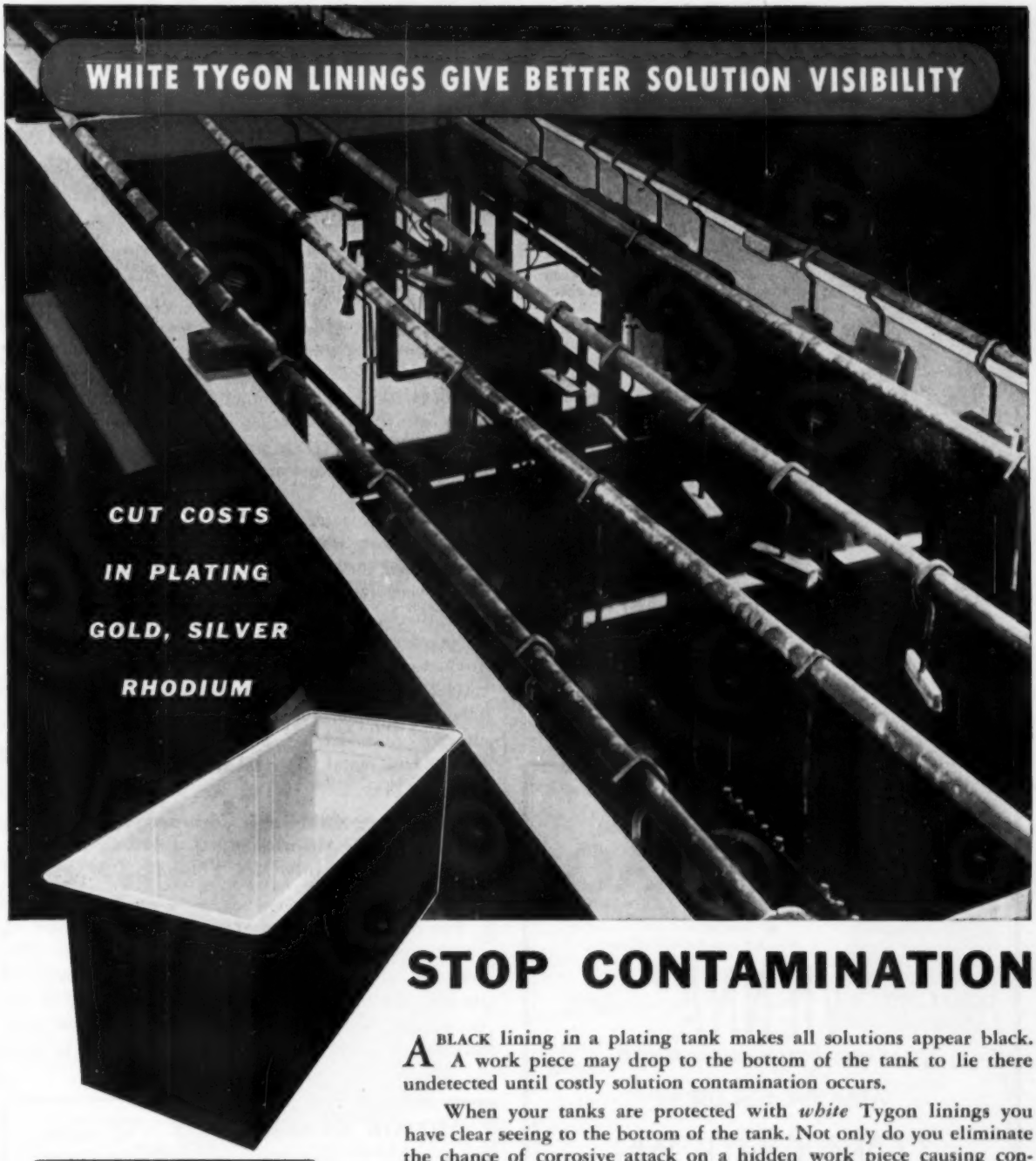

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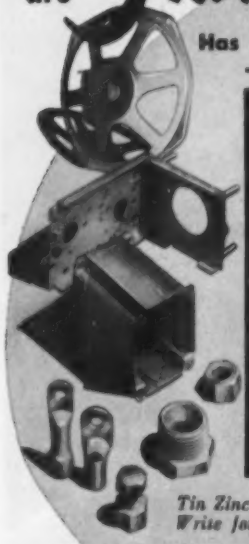

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Article Abstracts

for further research. Twenty-one references, 10 figures, 7 tables.

Recent Developments in Metal Spraying by the Powder Process. William McDermott. Trans. Inst. Met. Finishing, 1953, **29,** Advance Copy No. 3.

General principles of metal spraying by the powder process are described, and an account is given of an improved powder-spraying pistol. In this apparatus, powder is conveyed into an oxy-gas flame by any desired conveying gas under pressure: this allows the application of denser, less oxidized and better adherent coatings of zinc, aluminum, etc., than does the older spraying pistol wherein the powder is sucked into the pistol in an air stream, and also the spraying operation is faster and more efficient.

A simple quantitative adhesion test for sprayed metal coatings is described.

Some recent specialized techniques and applications are outlined, including the production of sprayed coatings of very low and of very high resistivity, the spraying of steels, the production of "aluminized" coatings by powder spraying followed by heat treatment, the production of hard, non-porous surfaces by "flaming" special sprayed coatings, and the improvement of the adhesion of zinc and aluminum coatings to be had either by an undercoat of sprayed steel or by preheating the base metal. Two tables, 3 figures.

A Laboratory Study of a Commercial Method of Electroplating Aluminum. J. Edwards and C. J. Swanson. Trans. Inst. Met. Finishing, 1953, **29.** Advance Copy No. 5.

The results are presented of a laboratory study of an electrolytic method of plating on aluminum. The permissible variations in the duration of the successive steps in the process have been determined and it has been established that stoving is essential to the production of strong adhesion. However, it has been

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1— 1500 A. HVW 6/12 V.	1— 800 A. G. E. 28 V.
1— 800 A. HVW 6/12 V.	1—1500 A. Cent. 28 V.
1— 600 A. Eager 6/12 V.	1—2500 A. Cent. 28 V.
1— 500 A. Chandey. 12 V.	**30 to 60 V.**
1— 300 A. Hobart 6 V.	1— 100 A. G. E. 32 V.
1— 200 A. Boissier 6 V.	1— 200 A. West. 32 V.
1— 200 A. U. S. 12 V.	1—1000 A. Cent. 32 V.
1— 150 A. HVW 6 V.	1—1000 A. Chandey. 40 V.
3— 125 A. Hobart 6 V.	1—1250 A. Cent. 45 V.
1— 120 A. Eager 7½/15 V.	1— 75 A. G. E. 50 V.
1— 100 A. HVW 6 V.	1— 325 A. West. 50 V.
	1—1500 A. G. E. 50 V.
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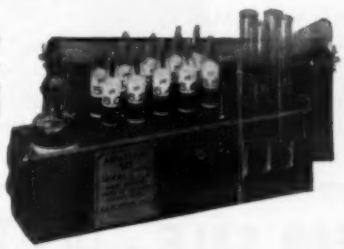

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Article Abstracts

found that stoving is unnecessary if a zincate immersion deposit is applied to the aluminum surface and stripped off in nitric acid prior to the electrodeposition stages of the process.

A tentative explanation of the results is advanced based on the view that the application and stripping of an immersion deposit improves the uniformity of the oxide film covering the basis metal surface and that stoving improves adhesion by producing sintering of the zinc deposit. Two references, 2 figures, 3 tables.

The Nature and Properties of the Anodic Film on Aluminum and its Alloys. H. W. L. Phillips, Symposium on Properties of Metallic Surfaces (Inst. Metals, London), pp. 237–252 (1952). C. A. 47, 2611–2612 (March 25, 1953).

Electrolytes used in anodizing lie between two extremes, those in which alumina is practically insoluble and those in which it is appreciably soluble. The former give thin films of high capacity, almost impermeable, and capable of withstanding a high voltage; these find their application in electrolytic condensers. The latter give thick, porous, absorptive films, and are used in commercial anodizing. The thickness depends on the process used and on the composition of the basis metal. The film is duplex, or even more complex, consisting of a thin almost impervious "barrier" layer, and a thick, porous, outer layer. As freshly formed, it is amorphous and may consist of an anhydrous oxide or contain adsorbed water. On boiling, it is converted to the monohydrate böhmite, and on heating in air it loses water to yield an oxide almost identical with γ-alumina. The film is hard and possesses little ductility. It is translucent or transparent, and is a good electrical insulator. Anodizing has very little effect on the mechanical properties of the underlying metal. If the film is not damaged, it markedly improves resistance to corrosion, but where it is broken, corrosion by pitting may be accelerated.

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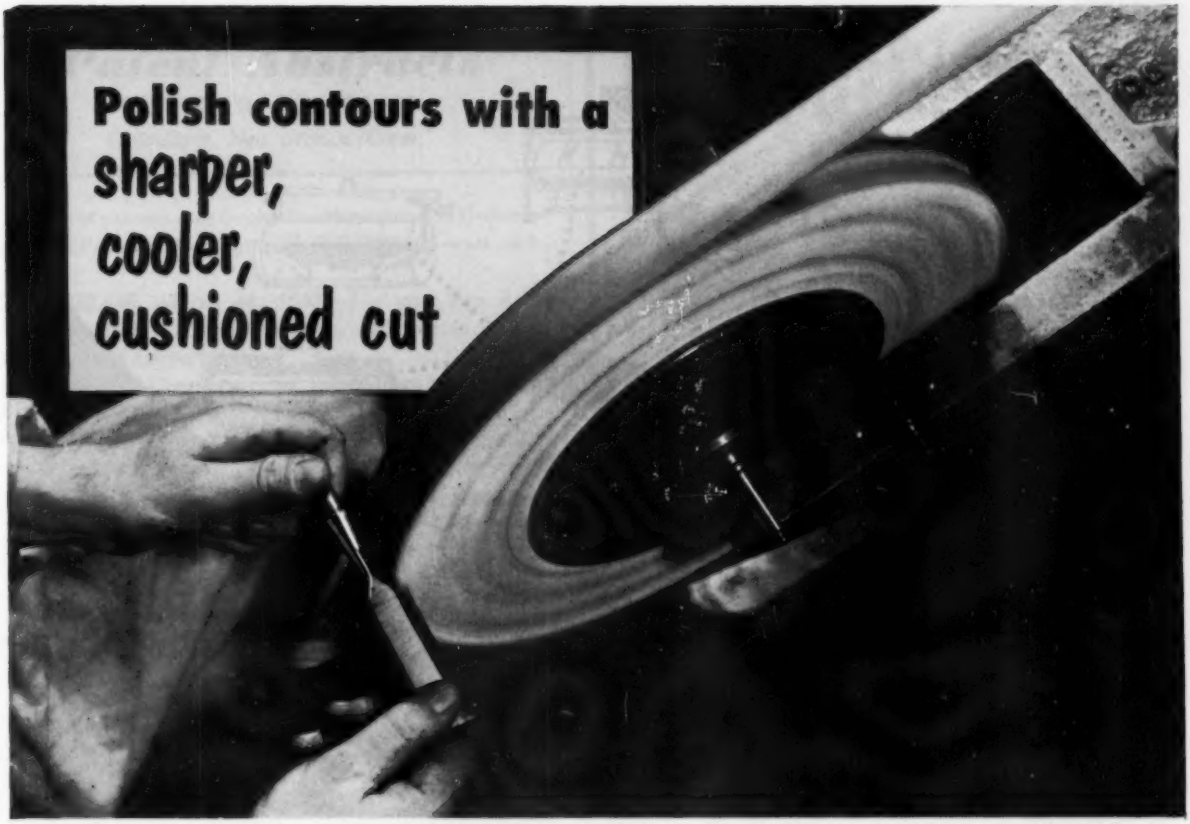

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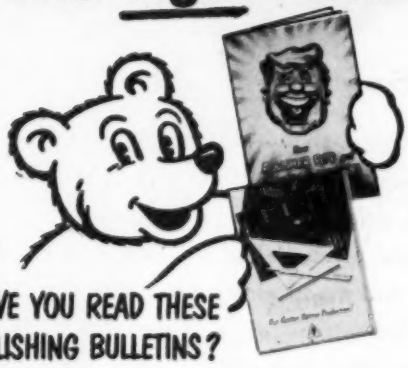

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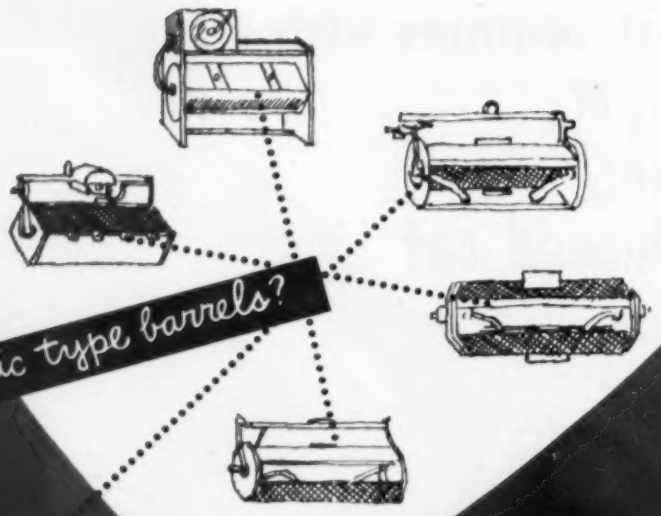

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Patent Abstracts

GEORGE B. HOGABOOM
Consultant, New Britain, Conn.

Copies of patents may be obtained by writing to Commissioner of Patents, Washington 25, D.C. Price 25 cents each.

No. 2,633,450, March 31, 1953—Tin and Tin Alloy Plating Bath—J. W. Andrews, assignor to United States Steel Corporation.

Plating baths composed as follows are particularly efficient:

	Grams per liter
Phenolsulfonic acid	30–60
Sulfuric acid	30–45
Tin	30–50
Addition agent	6–12

Equally good results are obtained with fluoboric acid type baths of the following composition:

	Grams per liter
Hydrofluoboric acid	45–85
Tin	20–40
Addition Agent	1–4

In the foregoing examples the term, "addition agent" is limited to any mixture of 4–4′ and 2–4′ isomers of dihydroxy diphenyl sulfone which consists of 60–85 per cent by weight of 4–4′ isomer and the balance essentially the 2–4′ isomer. The baths are preferably operated at a temperature of 90° to 120° F. They afford an operating current density range of 25–600 amperes per square foot.

An electrolyte which is particularly satisfactory for plating terne coatings is composed as follows:

	Grams per liter
Phenolsulfonic acid	65–330
Tin and lead	20– 80
Addition agent	5– 25

CLAIM 2. A bath for electrodeposition of tin com-

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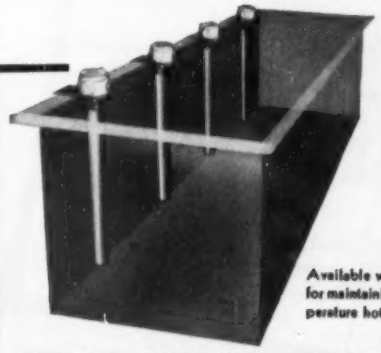

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prising an aqueous acid solution of tin, said acid being selected from the group consisting of hydrofluoboric acid, phenolsulfonic acid, sulfuric acid and mixtures of the last two named acids, and, as an addition agent an effective amount of a mixture consisting of 60 to 85 per cent by weight 4–4′ dihydroxy diphenyl sulfone; said effective amount being at least 2 grams per liter and not more than 1 gram per liter less than the maximum solubility of said mixture in said bath.

CLAIM 8. A bath for the electrodeposition of tin-lead alloys comprising an aqueous solution of 65 to 330 grams per liter of phenol sulfonic acid, 20 to 80 grams per liter of tin and lead, the ratio of tin to lead within said range adjusted to give the desired alloy composition and 5 to 25 grams per liter of an addition agent, said agent being a mixture consisting of 60 to 85 per cent by weight of 4–4′ dihydroxy diphenyl sulfone and the balance essentially 2–4′ dihydroxy diphenyl sulfone.

8 claims, 2 figures, 6 formulae.

References cited: U. S. Patents 2,288,282; 2,313,371; 2,392,137; 2,399,194. Journal, American Chemical Society, Vol. 67 (1945), pp. 238–240.

No. 2,634,235, April 7, 1953—Lead-Antimony, Alloy Electroplating Bath—A. L. Hitchens and R. G. Owens, assignors to Olin Industries, Inc., East Alton, Ill.

The plating bath may be prepared in any suitable manner. In one preferred method, however, metallic antimony is dissolved in a mixture of nitric and hydrofluoric acids. Tartaric acid is then added to the solution and the mixture is heated until the reddish brown fumes of oxide of nitrogen are no longer given off. It is important that substantially all the nitrate be removed in this operation since the presence of nitrate ion tends to cause the deposition of an uneven plate. The solution is then cooled and mixed with an aqueous solution of lead fluoborate containing free fluoboric and boric acids. The preparation of the bath is then completed by adding an addition agent such as glue.

CLAIM 4. A bath suitable for the electrodeposition of lead alloy containing about 8 to 10 per cent antimony having as its functioning ingredients in an aqueous medium antimony-lead, fluoborate anions, and tartrate anions, said ingredients being substantially in relative proportions of about 200 parts by weight antimony cations, about 1700 parts by weight of lead cations, about 1600 parts by weight fluoborate anions and about 300 parts by weight tartaric anions.

5 claims.

References cited: U. S. Patents 792,307; 952,704; 1,780,944. German Patent 629,071; 130,302. Knox, Metal Industry, Vol. 18, No. 6, June, 1920, pp. 264–266. Mellor Treatise on Inorganic and Theoretical Chemistry, Vol. IX (1929), pp. 381, 463. Korroziya: Borba s Nei, No. 2 (1942), pp. 48–49. Chemical Abstracts, Vol. 37 (1943), p. 1336. Transactions, Electrochemical Society, Vol. 28 (1915), pp. 325–338.

No. 2,635,075, April 14, 1953—Plating Process—J. F. *Vogt and R. J. Herbert, assignors to Knapp-Monarch Company, St. Louis, Mo.*

To improve upon the nickel plating process . . . we have devised an intermediate step between the nickel plating and the bright nickel plating . . . The usual nickel plating is done by energizing the circuit so that the current flows and nickel is deplated from the anode and plated on the work. . . . The next step is to place the work in a tank containing a solution of 6 to 16 ounces of sodium cyanide (10 ounces being preferable), 2 to 10 ounces of sodium carbonate (2 ounces being preferable) in one gallon of water. Four to 10 volts (6 volts preferable) current is then passed in a reverse direction through the solution. The duration of flow of current is preferably from two to five seconds.

The next step is to reverse the direction of the flow of current in the normal or plating direction, for approximately twenty seconds.

The third step in the process, the work is rinsed in clear water and then suspended in a bright nickel solution such as any disclosed in Harshaw United States patents.

Our process involving the intermediate steps improves the former processes as the resulting product does not blister and requires but a minimum of polishing and practically no buffing.

CLAIM 1. A method of preparing an article for electrodeposition thereon of a coating of bright nickel, said method comprising making said article the cathode in the first bath, thereafter making the anode for two to five seconds in the second bath containing coumarin, and said second bath (SIC) consisting essentially of from 45 to 120 grams of sodium cyanide and from 15 to 75 grams of sodium carbonate per liter of water, the voltage in the second bath being from 4 to 10, and thereafter reversing the current in said second bath to make the article the cathode at said voltage for about twenty seconds.

3 claims, 4 figures.

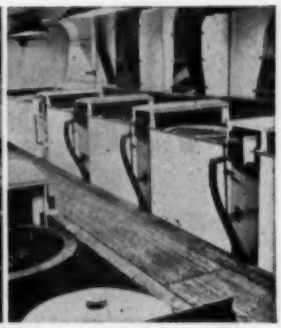
References cited: U. S. Patents 93,157; 1,534,709; 1,574,055; 1,918,605; 2,384,660; 2,451,341; 2,470,775. "Metal Finishing", pp. 68–72, 1947.

NOTE: The above (CLAIM 1) is quite confusing. This first nickel bath is a Watt's bath, the second nickel bath is a Harshaw. What the authors do is to plate in the first bath, then apply the reverse current in a sodium cyanide solution, rinse and then plate for a bright finish in the Harshaw bath. Really the second bath is the sodium cyanide solution and a third bath is the Harshaw solution.

No. 2,635,076, April 14, 1953—Bright Nickel Plating—*A. H. DuRose, assignor to Harshaw Chemical Co.*

The principal object of the invention is to provide a process of and solutions for producing semi-bright deposits of nickel which are at the same time ductile, easily buffable, resistant to corrosion and capable of

BEFORE—*Stainless steel chemical installation after 14 months' service handling corrosive acids.*



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For plating and metal finishing, Van Dorn fabricates its rigid non-plasticized polyvinyl chlorides into tanks, tank liners, plating racks, ducts, piping, etc. Available forms include: SHEETS 1/32" through 1"; PIPE—1/2" through 6" diameter (10 ft. lengths); ROUND BARS—1/4" through 2" diameter (10 ft. lengths); WELDING ROD—1/8" and 3/16" diameter.

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—are protected, in an opaque fuzed quartz shell, against corrosive chemical fluids.
This permits use under conditions which inhibit the use of other type heaters.

NOTE THESE FEATURES

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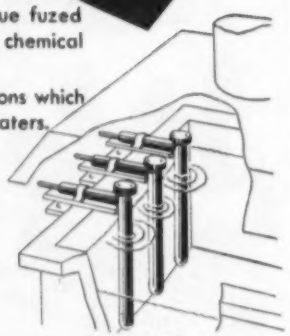

Bulletin IH
gives complete details

Amersil Company, Inc.
1471 Chestnut Ave., Hillside 5, N. J.
2024

improved coverage of imperfections in the base metal. A further object of the invention is to produce a fully bright deposit, which however is less ductile than the semi-bright deposits.

EXAMPLE 1

$NiSO_4.6H_2O$	300 g
$NiCl_2.6H_2O$	40 g
H_3BO_3	40 g
Sodium lauryl sulfate	0.5 g
H_2O to make one liter	
*p*H	3.5
Temperature	140° F
Current density, asf	50

This solution by comparative tests gives a deposit which buffs very easily and in such a manner that base metal imperfections are camouflaged to a large extent. The deposit is semi-bright.

EXAMPLE XI

$NiSO_4.6H_2O$	300 g
$NiCl_2.6H_2O$	40 g
H_3BO_3	40 g
Sodium lauryl sulfate	0.3 g
Benzene mono-sulfonate	10 g
H_2O to make one liter	
*p*H	3.2
Temperature	130° F
Current density, asf	30

This bath produces a bright ductile deposit.

CLAIM 1. A nickel plating solution essentially consisting of an aqueous acid solution of nickel material supplying nickel ions and an addition agent dissolved in said solution and capable of imparting to electrodeposits produced therein improved smoothness and buffability, said solution essentially consisting of aqueous solutions of nickel sulfate, aqueous solutions of nickel sulfate and nickel chloride, aqueous solutions of nickel fluoborate and nickel sulfate and aqueous solutions of nickel sulfamate and said addition agent being selected from the class consisting of coumarin and its substitution products wherein a substituent of the class consisting of alkyl radicals containing not more than four carbon atoms, acyl radicals containing not more than four carbon atoms, and chlorine, hydroxyl and carboxyl groups replaces a hydrogen atom of the coumarin, such addition agent being dissolved in said solution in concentration from 0.05 gram per liter to saturation.

31 claims, 11 examples.

References cited: U. S. Patents 1,818,229; 2,029,387; 2,196,588; 2,198,267; 2,198,268; 2,233,500; 2,238,861; 2,326,999. Great Britain 529,825. Ser. No. 351,241 Weiner (A. P. C.) published May 18, 1943, "Metal Finishing", April, 1940, pp. 206–210; and August, 1940, pp. 429–432.

Don't Blow Your Top!

you can PATCH or RECOAT your RACKS quickly with PC-7 Air Dry RACK COATING

In one hour — JUST ONE HOUR — you can patch your racks and have them back in service when you use

PC-7 AIR DRY RACK COATING

And it is no make-shift repair job either. PC-7 is compatible with most rack coatings and forms a close bond with them as well as the racks themselves.

PC-7 requires no baking oven — no primer coat — nothing but a brush or a dip tank. It is AIR DRY.

PC-7 gives a uniformly thick coating on both thin wire contacts and splines.

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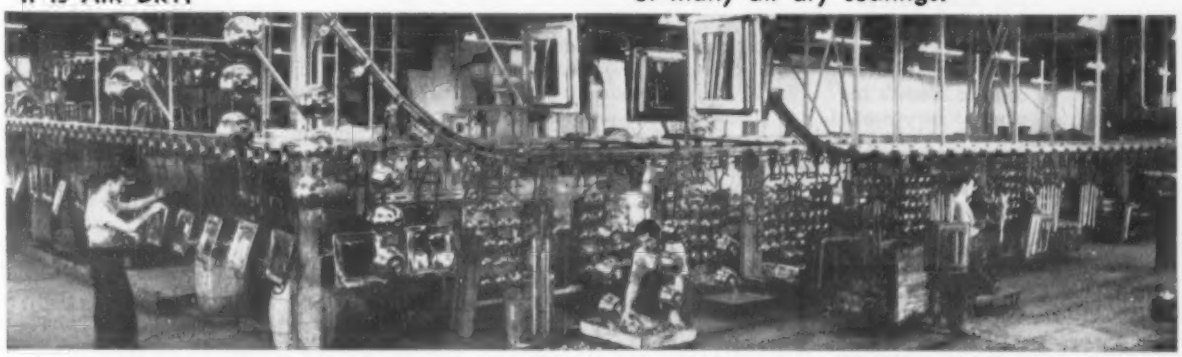
PC-7 has excellent chemical resistance to all plating solutions, acid pickling, etching baths, etc. Its performance has been tested in plating plants for nearly five years.

You can cut costs with PC-7 because with its high solids content it has twice the coverage of many air dry coatings.



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INDICATE A 716.

A.E.S. News

Proposed Amendments to A. E. S. Constitution and By-Laws

A Resolution to Amend the Constitution and By-Laws of the Society for Greater Freedom in Election of Delegates and for Clarifying Requirements for Representation at Meetings of the Supreme Society.

WHEREAS: the desirability of holding Interim Meetings for the purpose of hearing reports and proposals when it shall appear to be for the good of the Society is now recognized in our By-Laws (Article VI, Section 9), and

WHEREAS: it is also of advantage that Delegates who sit in Annual Meeting be those who have had the benefit of hearing Interim Meeting reports and proposals and discussions related thereto; and

WHEREAS: under the present provisions of the Constitution newly elected delegates may not be accredited in time to permit this desirable end; be it therefore

RESOLVED: that the following revisions be made in the Constitution and By-Laws of the Society:

Constitution: Part I, Article I, Section 1. Organization: From the end of the first sentence strike out the words: "in Annual Meeting".

By-Laws: Part I, Article III, Section 2. Credentials Committee: Strike out the section and substitute the following: The Credentials Committee shall be empowered to accept at any time the credentials of duly elected delegates, subject to review by the Supreme Society in Annual or Special Meeting (but not in Interim Meeting). In preparation for each Annual or Special Meeting it shall consider all credentials and proxies of delegates and shall present its findings for action by the Meeting.

By-Laws: Part I, Article VI, Section 3. Alternates: At the end of the Section add the following sentence: A Branch may cast a number of votes equal to the number of its duly accredited delegates provided that it has one such delegate (or accredited alternate) present on the floor.

By-Laws: Part II, Article VII, Section 1. Delegates: At the end of the first sentence strike out: "at least one month before the Annual Meeting" and substitute: "by such procedure as the Branch may establish". At the end of the first paragraph strike out: "not later than the fifteenth day of May" and substitute: "at least fifteen days prior to the Annual Meeting or to a Special Meeting to which the said delegates are to be accredited. Delegates shall serve until their successors are duly elected and accredited". Strike out the second paragraph, of which such parts as properly relate to Branches are covered elsewhere and the rest in Part I.

Received and found in order.

LAW COMMITTEE
MANSON GLOVER, *Chairman*

The above proposal by Baltimore-Washington Branch was discussed at the Columbus Interim Meeting. Its publication has been authorized by the Executive Board to make possible action by the Supreme Society during its 1953 Annual Meeting.

A Proposal to Amend the Constitution for Greater Freedom in Selection of Convention Dates.

WHEREAS: The Constitution of the Society now designates for the Annual Convention the four warmest months of the year; and

WHEREAS: these months are in certain cities otherwise eligible and well equipped for the entertainment of the Convention so extreme in heat that for humanitarian reasons they are barred from consideration; be it therefore

RESOLVED: that, to relieve the entailed hardship and to make possible when it may seem desirable the holding of the Convention in these cities, the Constitution of the Society, Part I, Article VI, Section 1, be amended as follows

Strike out the second sentence and substitute: "The Annual Meeting and Convention shall be held on dates agreed upon by the Executive Board and the Branch designated to entertain the Convention, hereinafter called the Host Branch".

Reviewed and found in order.

LAW COMMITTEE
MANSON GLOVER, *Chairman*

The above proposal, by Cincinnati Branch, was discussed at the Columbus Interim Meeting. Its publication has been authorized by the Executive Board to make possible action by the Supreme Society during its 1953 Annual Meeting.

Sustaining Members

The names of five new organizations, including one from Canada, were added to the continually expanding ranks of sustaining members by reports to Headquarters from the Chicago, St. Louis, Wichita and Toronto Branches. The organizations whose dues go to the support of A. E. S. Research are:

American Phenolic Corporation, Chicago, Ill.
Beech Aircraft Corporation, Wichita, Kans.
Canada Cycle and Motor Company, Ltd., Weston, Ontario, Canada
Chandeysson Electric Company, St. Louis, Mo.
James Plating Works, Inc., Chicago, Ill.

ONE OF A NUMBER of different tumbling barrels in which sample parts are processed in the new Norton barrel-finishing department.

Get the

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Can you "tumble" with the "Touch of Gold"? Can you be sure that you are adding value to your product each time the barrel turns in the barrel-finishing operation? Have you investigated this method as a way to more efficient processing and higher profit?

You can get samples processed without cost — in the newly enlarged Norton sample processing department with tumbling barrels of different types and capacities, plus auxiliary equipment such as a mechanically vibrated screen. Here Norton engineers, long experienced in tumbling procedures, determine for you just what barrel-finishing can do for the metal parts you send.

The range is wide. We have been successful in finishing parts ranging from tiny needles to castings and forgings weighing several pounds. Many manufacturers already have the "Touch of Gold" with substantial savings and production speed-up.

Tests result in detailed recommendations on barrel type, size, speed and amount of ALUNDUM* Tumbling Abrasive, amount of water, type and amount of compound or cleaner, time cycles and other data.

No obligation — send now. Mail us your representative sample parts plus (a) finished sample to be matched and (b) information on your present barrel-finishing equipment, if any, including type, size and speed of barrel. Send to NORTON COMPANY, Worcester 6, Mass., attention Sales Engineering Dept., Abrasive Division. Tests take about a week.

Also available is a 55-page Norton handbook on barrel-finishing. Ask your Norton Distributor for Form 501 or write us direct.

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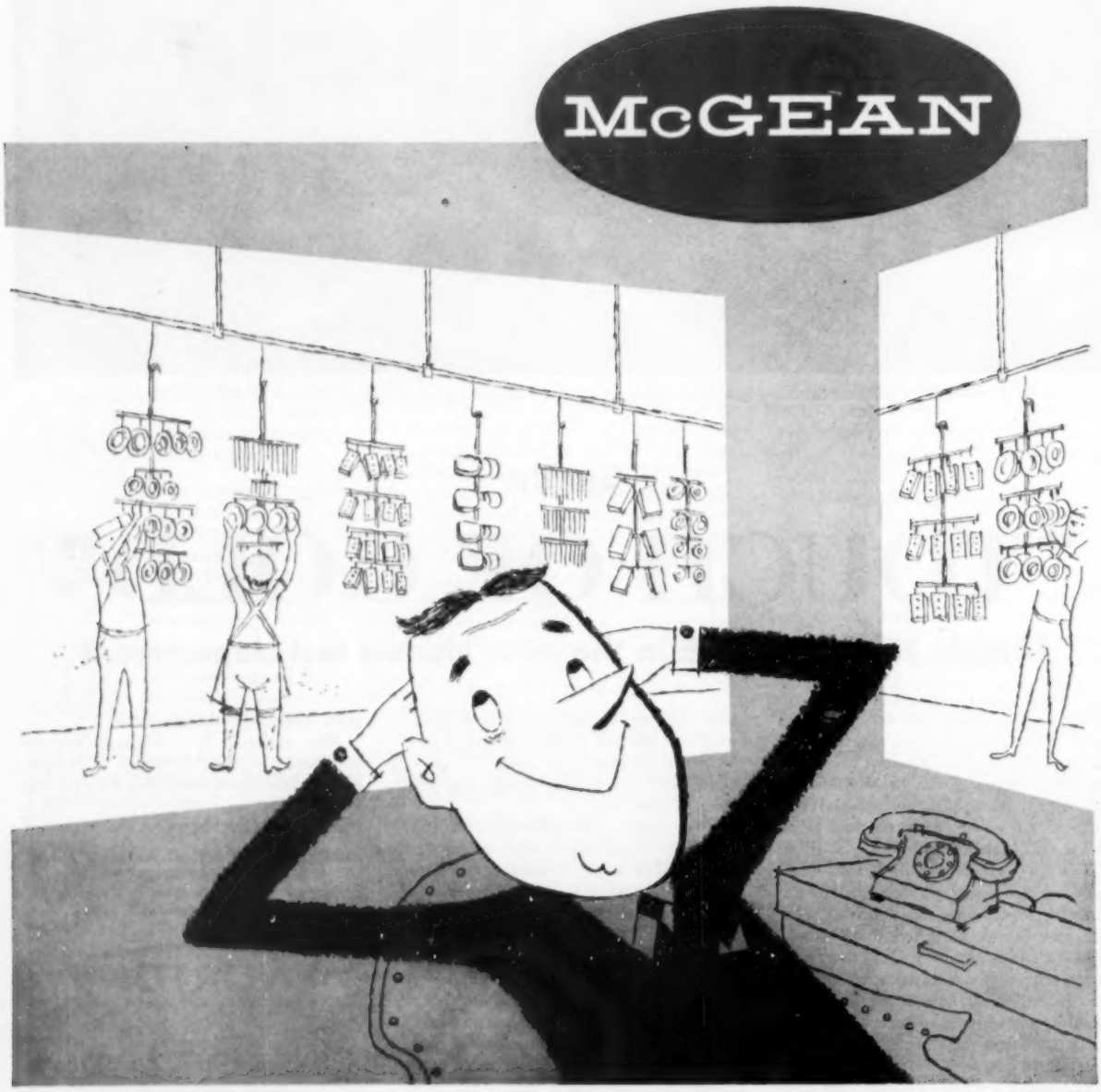


Branch News

CHICAGO BRANCH

Chicago's April 10 meeting played host to 35 ladies—wives and sweethearts of the members. With 105 men in attendance, a very pleasant 3 to 1 ratio kept most stags busy and all the ladies on the alert. After cocktails, an excellent dinner was served and everyone then adjourned to the auditorium for the Educational Session. Attendance prizes for the ladies were drawn by Mrs. Marion Longfield with Mrs. Frances Seebright, Mrs. Walter Warner and Mrs. Ed. Weil taking the prizes.

Joe Andrus of Croname, Inc., will guide Branch destinies during the coming year as president. He will be ably assisted by Elmer Olson of Oakite as first vice-president. Paul Glab of Northwestern Plating Works continues as secretary-treasurer, while librarian duties will be discharged by Russ Harr of Western Electric Company.

H. A. Gilbertson, revered member of Chicago Branch and former national society president, now has a pot. It seems hard to believe that Mr. Gilbertson could have continued his labors for A. E. S. all these years without having a pot of his own. It has never been clearly established whether he has used other members' pots or whether he just did without—but it makes little difference now because, as we said before, Mr. Gilbertson now has a pot he can call his own! If you haven't guessed by now, H. A. Gilbertson became a member of that exclusive society lovingly labeled, "The Order of the Pot". In making the presentation, Walter Pinner made a humorous but clear distinction between pots with handles and pots without handles. Needless to say, Mr. Gilbertson's pot has a handle. It is also gold plated, lacquered, preserved under glass, and fittingly inscribed to commemorate his 40 years of selfless devotion to the high aims and purposes of the Society. Sincere congratulations, H. A.! May your pot be filled to overflowing forever more!

Reports from retiring officers indicate continuous growth in Chicago Branch activities. Over 40 new active members were added during the past year with the present total membership standing at over 400. Sustaining memberships were increased by eight. Financially, the Branch is using black ink, due largely to the Industrial Finishing Exposition sponsored by Chicago last June and the successful annual banquet held last January. Incoming officers have lofty targets to aim at, and the retiring officers are due an accolade for high performance under trying conditions. Ray Ledford, Klem Petrosius, Elmer Olson, Paul Glab, Dr. Monaweck, Marion Longfield, Rudy Hazucha, Art Bartman, Joe Andrus, Clyde Kelly, Len Pravel, Harold Smallman, and every participating Chicago Branch member has earned a star and a bar for meritorious service.

Bill Carr of Lear, Inc., gave an interesting insight into the mechanics of guided missiles and automatic pilots with his address and demonstration during the educational session. His dramatic approach to a highly technical subject kept everyone's attention until the end. His personal knowledge of the engineering drama that preceded the development of these commonly accepted technical triumphs made for a highly exciting educational evening. Even the ladies proved interested in the intricate problems related to automatic flight and guided missiles.

Edward O. Stanek,
2nd Vice-President

CINCINNATI BRANCH

The Branch's Annual Educational Session and Dinner-Dance held on March 28 at the Sheraton-Gibson Hotel was an informative and successful event.

A. E. S. Third Vice-President Clyde Kelley presided as session chairman at the educational session during which Ezra Blount, Editor, Products Finishing Magazine, taked on "Impressions of the Japanese Finishing Industry." Carl F. Hansen, Advance Tinning Company, Chicago presented a paper on "Principles of Effective Job Shop Management".

A symposium on waste treatment featured "Why We Must Treat Our Waste" by Hudson Biery, Ohio River Valley Water Sanitation Commission, and "Methods for Treating Metal Finishing Wastes" by H. S. Kline, Frigidaire Division, General Motors Corporation, Dayton, Ohio. Other panel members were J. E. Kinney, Ohio River Valley Water Sanitation Commission and A. M. Reed of Electric Auto-Lite Company, Lockland, Ohio.

CINCINNATI BRANCH

An excellent crowd of 45 men was on hand for the meeting on April 22, with the proceedings getting under way with the introduction by President R. D. Miller of Herman Struckhoff, President, LaSalco, Inc. Struckhoff discussed "Barrel Plating" and stressed the importance of proper loading and the necessity of taking into consideration the size of the cylinder. Pointing out that the diameter—not the length—was important, the speaker stated that a load must be as evenly distributed as possible below the center line since overloading would cause brown spots. The speaker then illustrated what would happen with improper loading by showing a film on the subject.

Charles Wise reported on the Educational Session and Dinner Dance of March 28. Not only from a financial standpoint but both artistically and educationally, all agreed that the event was thoroughly successful.

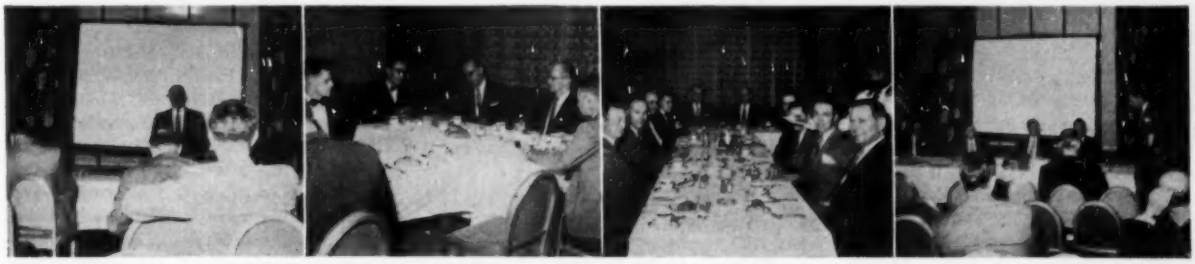
Ezra A. Blount, Chairman of the Nominating Committee, presented the candidates for office with the following being elected:

President—Carl F. Truman
First Vice-President—Wm. D. Gordon
Second Vice-President—Chas. Sorber
Librarian—R. K. Rarich
Secretary—William Young
Treasurer—Charles T. Nuzum

Robert D. Miller was elected to the Board of Managers, William Albohn and Stewart Chipman being holdovers.

Mr. Miller, the retiring President, then introduced the new President who thanked the outgoing administration for their excellent tenure of office. He appointed Will Loveless, Ezra A. Blount and himself to make a survey for an Educational Session and Dinner-Dance in 1954.

The resignation of Earl Robbins from



Cincinnati Branch Annual Educational Session

the Society was regretfully accepted, and applicant ROBERT G. STRINGER was elected to membership.

Letters were read calling attention to: PLATING magazine's photographic contest and "Tricks of the Trade" column.

The following delegates and alternates to the June Convention were appointed:

Delegates: EZRA A. BLOUNT, WILLIAM GORDON, LEROY CRITCHFIELD

Alternates: HAROLD F. SMITH, WILLIAM YOUNG, CHARLES T. NUZUM

After introducing the various guests at the meeting, the proceedings were adjourned so that members could enjoy the usual Social Hour which was sponsored by LaSalco, Inc.

CHARLES WISE, *Secretary*

DETROIT BRANCH

Something new was tried by the Branch. Since many of the members' wives have wondered for a long time what goes on at an Electroplaters' Meeting, it was decided to have a Ladies Night with a program of interest to members and wives alike.

This Ladies Night took place on March 6, in the Hotel Statler with approximately 160 members, wives, and guests present. PRESIDENT H. E. HEAD called the meeting to order at 8:15 P. M. and introduced NATIONAL SECOND VICE-PRESIDENT RALPH SCHAEFER, NATIONAL PAST PRESIDENT CLEVE NIXON and the Officers of the Detroit Branch.

JOE GURSKI, Secretary-Treasurer, read the names of seven applicants for membership. All were unanimously elected into the Branch.

Delegate Cleve Nixon reported on the Columbus Interim Meeting. He said there was considerable discussion regarding technical papers being submitted to PLATING. Some at the meeting advocated paying for technical articles, while most felt that papers should be submitted for the prestige so gained.

Nixon also commented on the proposal to enlarge *Proceedings* to include all technical articles from PLATING as well as technical papers presented at the annual convention. This can be done at no added cost thanks to the work of National Second Vice-President Ralph Schaefer. Nixon urged everyone to read the editorial in the March issue of PLATING magazine which deals with this in detail. Nixon also said that LEONARD WEEG of the Rockford Branch has proposed that the Society be broadened to include allied fields such as barrel finishing, painting, polishing, and similar processes. This proposal is now under study.

The meeting was then turned over to EDUCATIONAL CHAIRMAN FRED OLMSTEAD who showed the color movie, "We Discovered Tampa", a film journey into Florida's tropical vacationland. Also shown were a number of slides, which were of particular interest to the ladies, from Aunt Ella's luncheon at the 1952 National Convention in Chicago.

The principal speaker, WILLIAM CARR, then delivered a most interesting talk on "The Principles of Guided Missiles".

Such modern day wonders as aircraft-auto pilots, buzz bombs, jet missiles and similar modern wonders were discussed and explained in a non-technical and most enjoyable fashion.

One of the many amazing facts Carr mentioned was that with present-day knowledge of auto pilots and guided missiles, it is possible to fly a V-2 type missile half-way around the world and hit a target 300 yards in diameter.

Many interesting questions followed his talk and before the evening was over, such things as flying saucers and trips to Mars were discussed in detail.

Refreshments were served following adjournment.

E. J. KUBIS, *Publicity Chairman*

DETROIT BRANCH

PRESIDENT H. E. HEAD called a meeting to order on April 10, at 8:10 P. M. in the Hotel Statler with approximately 120 members and guests attending.

ASSISTANT SECRETARY-TREASURER R. J. RACINE read the names of six applicants for membership. All were unanimously elected into the Branch.

Reports from Committees were as follows:

Research Finance—In the absence of CHAIRMAN B. LEONELLI, R. J. Racine called on the membership to exert a greater effort to get more sustaining members. Detroit has only about one-half as many sustaining members as Chicago. Membership was asked to submit ideas for ways to get better support.

Stag Day—CHAIRMAN A. EMMERICH announced that preliminary plans had been made—party to be at Glen Oaks Country Club—bigger than ever with free golf—free breakfast—free beer—free dinner at a bigger and better location.

Membership—CHAIRMAN L. BORCHERT said that membership had increased from 491 at the beginning of the fall season to 510 at this meeting.

Ballot Counting—CHAIRMAN D. BIGGE announced that the officers elected for the fiscal year 1953–1954 were as follows:

President—L. C. BORCHERT
First Vice-President—J. GURSKI
Second Vice-President—L. M. MORSE
Secretary-Treasurer—R. J. RACINE
Educational Chairman—F. E. OLMSTEAD
Board of Managers—G. FRIEDT, JR., F. WATT, E. A. STEEGER
Delegates—C. F. NIXON, J. GURSKI, H. E. HEAD
Delegate Alternates—W. PINNER, L. M. MORSE

The new officers were installed by Delegate C. Nixon and were ordered to immediate duty.

Educational Chairman F. Olmstead showed Part Three of the International Nickel Company Film, "Corrosion in Action—Passivity and Protective Films", and then introduced the principal speaker, ALLAN WOODELL, Senior Statistical Quality Control Analyst, Ternstedt Division, General Motors Corporation. His subject, "Applications of Quality Control Techniques to Plating Processes", was a timely discussion of the economy, improvement in quality, and increase in efficiency possible in the plating industry by the adoption of this relatively new tool.

Woodell defined staistical quality control as a system of inspection, analysis, and action as applied to a manufacturing process. He said it involves mathematical formulae and calculations which during the last five years have been simplified and condensed so that the methods can now be understood and applied by laymen.

Charts were shown citing examples of savings in plating cleaners, acids, and chemicals in Ternstedt Plants by regular and frequent chemical control, the control data being charted and displayed in a prominent place in the plant. Since success in quality control depends upon enthusiastic reception by workmen, Woodell emphasized that it was very important that the data showing improvement by regular control be plotted and put on the factory floor where everyone can see it.

It was explained also how statistical control methods may be employed for elimination of metal waste by variation in plate thickness. Thickness data are plotted from specimens selected at random. If thickness varies more than a predetermined maximum, the plating process is said to be out of control necessitating immediate corrective measures.

After numerous questions, both general and concerning the application of the methods to specific problems, the meeting was adjourned at 10 P. M.

Refreshments were served following adjournment.

E. J. KUBIS, *Publicity Chairman*

HARTFORD BRANCH

A regular meeting was held at the Bond Hotel on March 16 with 60 members and guests present. Preceding the meeting International Nickel Company's color film, "Corrosion in Action", was shown.

GEORGE HOGABOOM was technical chairman for the evening.

Guest speaker, MYRON DIGGIN, Technical Director, Hanson-Van Winkle-Munning Company, talked on "Modern Precious Metal Plating". He reviewed the early history of silver plating and described the new bright silver plating process, Silver-Lume. The new bath employs potassium salts and two brighteners and produces brilliant, mirror-like deposits. Features of the new process are: higher current density range, non-critical operation and control, increased tarnish

resistance, increased adhesion, pure deposits and exceptional throwing power. Other bright silver plating processes were noted as were methods of treating silver for increased tarnish resistance.

STANLEY PLATOZ, *Secretary*

HARTFORD BRANCH

A regular meeting was held at the Bond Hotel on April 20 and 59 members and guests were present. Preceding the meeting the remainder of International Nickel Company's color film, "Corrosion in Action", was shown.

Guest speaker for the evening was WALTER KISNER, research engineer, Springfield Armory, whose subject was "Vapor Deposition of Metals". He reviewed briefly the various methods of metal deposition such as plating, hot dipping, metal spraying, impregnation process, welding and vapor plating. Vapor deposition methods were described as evaporation, sputtering, thermal decomposition of volatile compounds such as carbonyls and the hydrogen reduction of a compound of the metal. Kisner then gave a detailed description of the vapor deposition of molybdenum by hydrogen reduction of molybdenum pentachloride.

H. SANDERS was technical chairman for the evening. After a brief introduction by A. LOGOZZO the following officers were installed for the coming year:

President—MRS. JULIA MADZIK
First Vice-President—E. DOWLING
Second Vice-President—J. MCINERNEY
Secretary—S. PLATOZ
Treasurer—S. BEGG
Educational Adviser—H. SANDERS
Educational Committee—G. COLOMBIE, Chairman; W. ACKER, B. COHEN, T. MCFARLANE
Board of Managers—R. MCCAHAN, W. CULLEN, G. TETLOW

STANLEY PLATOZ, *Secretary*

INDIANAPOLIS BRANCH

The March meeting was held on the 4th at the Fox Steak House with 41 present. Guests included THOMAS O'BRIEN, Chicago Branch; A. J. EMMERICH, Detroit Branch, and HAROLD FAINT of Chicago Branch, who was our speaker of the evening. Mr. Faint's subject was: "The Use of De-Mineralized Water in the Plating Industry". The process was fully explained and reasons given proved that demineralized water is necessary in many localities for plating solutions.

The business meeting followed the program. Two new members were voted into the Society: LOREN D. STEVENS and JOHN CORNPROPST, both from Columbus, Ind., and both with Arvin Industries.

PRESIDENT DON PATRICK reminded members to reply to the Headquarter's questionnaire if they hadn't already done so. A letter from FRANKLYN MACSTOKER, which announced a proposed policy change in PLATING, was read.

Appointed as delegates to the National Convention in Philadelphia were the following: MISS EDNA ROHRABAUGH, JOHN HOLLAND, JOHN HOOD with DR. ABRAHAM MAX, BERT HAWHEE, CHESTER WEEKLY as alternates.

In view of the fact that the increase in dues went into effect after our fiscal year begun, Dr. A. M. Max made a motion that dues for present fiscal year members be billed at $8.00 and any deficit incurred by the per capita tax of $1.00 per member be made up by the treasury.

HARRY SMITH seconded the motion and it was passed.

The meeting adjourned at 9:40 P. M.

EDNA ROHRABAUGH,
Secretary

INDIANAPOLIS BRANCH

One of the largest groups of members and guests of the Branch turned out for the April 1 meeting at Fox Steak House. Thirty-five members and 16 visitors enjoyed a steak dinner and a good program. Two new members, JAMES E. ABEL, Columbus, and EARL H. MESSMORE, Indianapolis, were voted into the Society.

Speaker for the evening was PERRY MILLER, Indiana State Board of Health, who discussed the code which is in effect in Indiana concerning stream pollution. Miller stated stream pollution can be prevented by having good housekeeping in the plants which in the long run will save in other ways. He presented three books which are available at a nominal cost from the Ohio River Valley Water Sanitation Commission. The stream pollution code which has been in effect since

Extra ways to save with Coating 218X

NOTHING BETTER FOR RACKS . . .

Users of Coating 218X know this green plastisol can't be beaten for rack protection They've seen it stand up in all plating and anodizing baths, the toughest cleaners, even vapor degreasing cycles. Bumps, abuse, abrasion—all taken without damage by this flexible, shock absorbing, thick coating. In short, it gives them more rack protection, with less maintenance, and therefore the least cost.

As on racks, a single application of Coating 218X will give outstanding protection and eliminate need for frequent maintenance on:

- dipping baskets
- drain boards
- conveyor hooks
- tote boxes
- anode hooks
- tank linings
- plating barrels
- flexible cable
- hand tools
- heat exchangers

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January 10, 1953 can be changed only after a public hearing is granted. This code is an assurance to the board that measures be taken to stop anything getting into the streams in the state. Among ways that were suggested for plating departments to alleviate any escape of cyanide into sewers were pits around tanks and separation of rinse water from floor drain systems.

Also discussed was the question of code enforcement. At least 1,000 industries in the state use cyanide. A letter is to be sent to each industry, a copy of the code and two copies of inventory form. This inventory form is to be filled out and returned. These will be in the mail very soon.

Miller stressed that the Stream Pollution Board is not going to be tough, so to speak, on anyone but the code will be enforced. Each industry will be checked and many are not in the wrong about disposal of cyanide. A personal check will be given any industry if they so desire concerning the drainage.

Mr. Pritchard, a member of the Ohio Valley Water Sanitation Commission, was present and reported on the progress of that commission. Their chief interest is in the pollution of fish and the use of water for public consumption.

Discussion and questions by the group took place after the talk and much interest was shown in this subject.

The meeting adjourned at 9:50 P. M.

Edna Rohrabaugh, *Secretary*

KANSAS CITY BRANCH

A regular meeting of the Branch was held March 26, at the Pickwick Hotel with 36 members and 8 guests present.

Meeting was opened by President Bill Brumwell, following which the election of officers to serve for the coming year was conducted. Elected were:

President—Louis E. Barkley
Vice-President—Herbert H. Clark
Librarian—John V. McCandlish
Treasurer—Warren B. Eliot
Secretary—Olin K. Bock

The newly elected President assumed his duties and presided for the remainder of the meeting.

First Vice-President G. P. Swift was introduced. He presented the Kansas City Branch their permanent charter and gave a brief resume of the work being carried on by the Society.

Speaker for the evening, Henry De Witt, United Chromium Company, gave a very informative talk on chromium plating. This was followed by the showing of a film, supplied by the Atomic Energy Commission, "Operation Greenhouse".

Olin K. Bock, *Secretary*

LANCASTER BRANCH

Twenty-six members and guests attended the meeting of March 13 at the Arcadia Cafe. The nominating committee presented the following list for officers for 1953–1954:

President—John Reynolds
Vice-President—Ray Vines
Secretary-Treasurer—Harry Saylor
Librarian—George Wells
Board of Managers—William Fordney, Carl Herbst, Harvey Reynolds
Delegates—William Klunk, Harry Hovis, William Fordney
Alternates—Ray Vines, Joe Shockor, Harry Saylor

Hubert M. Goldman, Enthone, Incorporated, was then introduced and talked on "Adhesion of Electroplating Deposits, New Methods of Cleaning and Oxide Removal". He discussed the factors which will affect the adhesion of plating.

He concluded with a demonstration using a portable unit and an alkaline oxide remover, with which a heavy coating of rust was removed. Another demonstration showed the removal of rust and the plating of cadmium in the same bath.

Harry A. Saylor, *Secretary*

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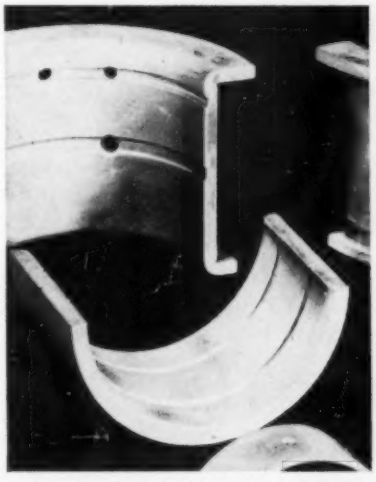

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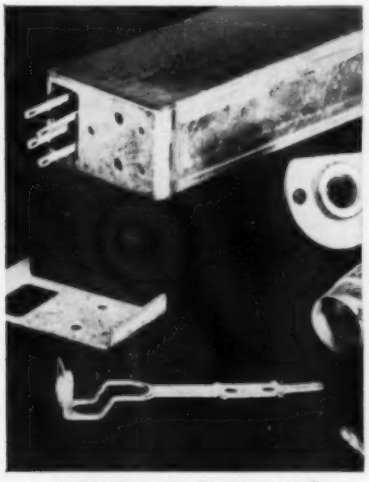

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- ☐ B&A Metal Fluoborate Solutions (outlines important applications of the various B&A Fluoborate baths)

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Organization_____

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PL-6

Branch News

LOS ANGELES BRANCH

Final reports were given on the annual technical session and dinner-dance held March 21, and the consensus was that it was the most successful meeting of this type held to date. All functions were at the new Statler Hotel, with the technical session starting at 10:00 A. M. and lasting until 4 o'clock in the afternoon. Four excellent speakers were obtained for these sessions by LIBRARIAN STUART KRENTEL, and there were over 200 members and guests in attendance at these meetings.

The evening dinner-dance started at 7:00 P. M. in the Pacific Room with 540 members and guests in attendance. The excellent dinner, fine music, numerous door prizes and beautiful decorations all contributed to the success of the occasion. GEORGE HETZ, General Chairman of this session, and all of the committee members were well repaid for the long hours and hard work entailed in this endeavor.

At the regular meeting, held April 8, speaker of the evening, T. P. ROGERS, American Chemical Paint Company, presented a paper on "Inhibitors for Metal Finishing".

He pointed out that while inhibitors were used primarily in the pickling of steel, more usage was being made in the pickling of ferrous and non-ferrous alloys, magnesium and aluminum.

The benefit obtained from inhibitors lies in the prevention of hydrogen embrittlement, acid losses and corrosion caused by spray, loss of acid, loss of metal, and the giving of a cleaner part after pickling.

The types of inhibitors are many and varied, with most of the presently used materials being developed since 1922. One of the later improvements in pickling has been the removal of iron from pickling solutions by ion-exchange, but this has been used on a limited scale.

Following Rogers' talk, an active question-and-answer period was held and the meeting was adjourned at 9:30 P. M. by PRESIDENT MYRON ORBAUGH.

EARL W. ARNOLD,
Secretary

LOUISVILLE BRANCH

A regular meeting was held March 19, at Korfhages Restaurant, Louisville, with a dinner served at 6:30 P. M. PRESIDENT OERTEL opened the business and open meeting at 8:00 P. M. with 26 members and guests present.

Appointed to the Nominating Committee were: S. J. BEYER, Chairman; WILLIAM FRANCIS, BUD ECKERLE, HERB PATE.

ED BRUCK of the Indianapolis Branch, spoke briefly about the concern manifested over the waste disposal by the plating industry in Indiana. A law was enacted that cyanide and other toxic solutions cannot be dumped into the city sewers unless the solutions were properly treated for removal. Concrete pits are now necessary under the plating tanks which hold toxic solutions.

Educational Chairman Stanley J. Beyer introduced KARL JUND, Globe Chemical Company, Dayton, Ohio, as the speaker of the evening. Jund, in his talk on chemical polishing and electropolishing of metals, explained the history of electropolished finishes and made the following general summary:

1. Zinc and lead cannot be electropolished.

2. Electropolish with glycolic and sulfuric acids on nonferrous metals such as aluminum, brass and copper to obtain a very bright finish.

3. Electropolish with phosphoric and sulfuric acid on ferrous metals. Stainless steel and monel metal may be processed to a very bright finish.

4. Burrs on various metals can be removed by electropolishing.

5. Copper racks can be used in electropolishing.

6. Electropolishing is not comparable to hand polishing and buffing for a high lustrous finish but is more economical and suitable for many applications. Electropolishing costs approximately $.065 per square foot of surface according to one estimate that was made.

7. Electropolishing is done from 200–250 asf with voltages of 9 to 18 with temperatures for steel from 170–200° F and for non-ferrous metals, temperatures from 135–170° F.

Samples of electropolished work were distributed for inspection.

Refreshments were served, courtesy of HARRY WUEBBOLD and the Globe Chemical Company, Dayton, Ohio.

Meeting adjourned at 11:00 P. M.

J. G. STERLING, *Secretary-Treasurer*

MELBOURNE BRANCH

The 76th regular meeting was held on March 19 at Melbourne Technical College, with PRESIDENT G. WALKER and 110 members present.

The President extended a welcome to DR. BLUM, formerly of National Bureau of Standards, U. S. A., who gave greetings to Melbourne Branch from the Executive Board of the Supreme Society. A vote of appreciation and congratulations was extended to Dr. Blum on the occasion of his 50th year of membership with The American Chemical Society, on this the same night, that members of the American Chemical Society were meeting in America to commemorate the unique occasion.

In his lecture, "Electroplating Research at National Bureau of Standards", Dr. Blum stated that it was in 1913 that the Bureau of Standards received the first request for assistance from a Plating Plant.

He discussed at length research, with the aid of informative slides, on chromium, bright nickel, copper, aluminum, etc., and application of rare metals.

After an interesting "Question Time" put to the speaker by members, R. TAYLOR thanked Dr. Blum for giving his most informative address, which was the first given to the Branch by a representative of the Supreme Society, and gave a greater bondship between the parent Society and Australian Branches.

The meeting closed at 10:00 P. M.

A special meeting was held at Melbourne Technical College, on March 24 where Dr. Blum addressed 60 members and visitors on "American Electrotyping and Electroforming Practices". On March 26, Dr. Blum spoke to 50 members and visitors of Melbourne Branch at a meeting held at the Melbourne University on "Corrosion". After this address, the International Nickel Company's color film, on corrosion was screened and thoroughly appreciated by members.

S. B. PEARCE, *Secretary-Treasurer*

NEWARK BRANCH

A regular meeting was held at the Robert Treat Hotel on March 20 with 102 present.

PRESIDENT EHRHARDT called the meeting to order at 8:40 P. M. and welcomed guests A. E. S. PRESIDENT F. MACSTOKER, A. E. S. SECOND VICE-PRESIDENT R. A. SCHAEFER and EUGENE COMBS of the Cleveland Branch.

Applications for membership from WILLIAM NATTRASS, JULIUS ZIMMERMAN and MICHAEL ZAK were voted to take the regular course. JOSEPH EPINGER, K. O. ROBINSON, ARNOLD TANNENBAUM and CHARLES GERBER were elected to membership, and MELVIN TEETS was accepted as a transfer from the New York Branch.

Elected as officers for the coming year were:

President—ROBERT HORROCKS
First Vice-President—J. GUMM
Second Vice-President—C. STRUYK
Secretary-Treasurer—G. WAGNER
Recording Secretary—G. REUTER
Librarian—T. AUSTIN
Sergeant-at-Arms—W. GRIGAT
Board of Managers—M. DIGGIN, F. ENGLAND, R. EHRHARDT
Delegates—M. DIGGIN, G. WAGNER, L. DONROE
Alternates—F. ENGLAND, R. HORROCKS, J. GUMM

A. E. S. President MacStoker installed the newly elected officers with a few well-chosen words.

Librarian Tom Austin introduced the first speaker of the evening, a member of Newark Branch, DR. HENRY LINFORD of Columbia University, whose subject was the "Atomizer Test".

Dr. Linford gave a detailed explana-

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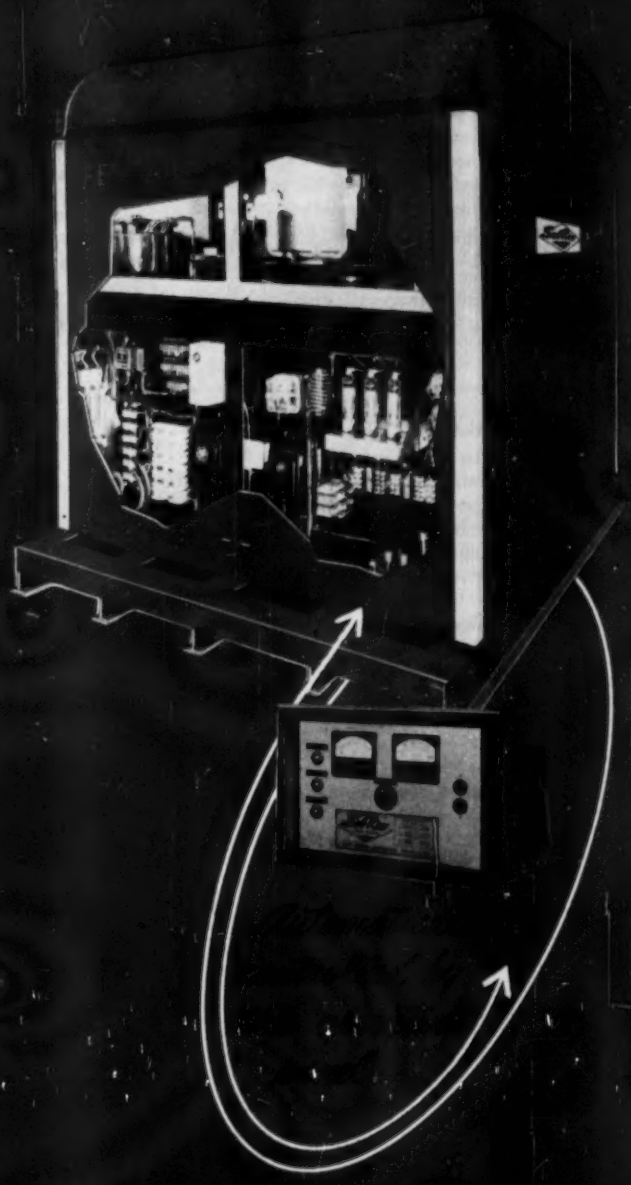

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The next speaker introduced by Librarian Austin was GEORGE BEST, Mutual Chemical Company, whose subject was "Anodizing of Aluminum".

There was a rising vote of thanks for the two speakers. The meeting adjourned at 11:10 P. M. for refreshments.

GEORGE REUTER,
Recording Secretary

NEW YORK BRANCH

A meeting was called to order by PRESIDENT A. AMATORE, on April 10, at the Hotel Statler, New York.

Roll of Officers was called and MR. MAHER and MR. STERLING were noted absent.

The minutes of the last meeting were read, and approved.

There being no other business, old or new, the meeting was turned over to LIBRARIAN P. VEIT who presented R. OPEROUSKY of the Chem-Clean Corporation. Operousky spoke on "Modern Industrial Paint Stripping", which was most interesting to all.

LESTER LEVINSON,
Recording Secretary

PHILADELPHIA BRANCH

A regular meeting was held at Mosebach's Restaurant on March 27 with 40 members and guests attending. One new active member was admitted and five membership applications were received. The secretary read DR. FOULKE's letter on "Tricks of the Trade".

The following were elected for the 1953–1954 term:

President—E. F. OTTENS
First Vice-President—H. TRUSDELL
Second Vice-President—R. L. FARREN, JR.
Secretary—I. W. MARCOVITCH
Treasurer—G. M. LONG
Librarian—D. P. VOLINO
Board of Managers—A. H. POPE, N. VERRELLE, P. MENTZER, SR.
Delegates—S. HEIMAN, G. M. LONG, I. W. MARCOVITCH
Alternates—P. MENTZER, SR., F. FULFORTH, A. H. POPE

The newly elected officers and delegates were inducted into office by Past Supreme President Fulforth. A past president pin was awarded to Alfred H. Pope; the newly elected Branch President, Edwin F. Ottens, making the presentation.

Speaker of the evening was MYRON B. DIGGIN, Hanson-Van Winkle-Munning Company, whose topic was "Modern Silver Plating". Diggin covered the economic importance of silver plating, the history and composition of typical baths, including previous attempts at bright plating. He described the various present-day bright solutions, including the better known proprietary baths, and exhibited samples of bright silver plated ware.

The meeting adjourned at 9:45 P. M.

I. WM. MARCOVITCH, *Secretary*

PITTSBURGH BRANCH

The Branch held its regular meeting on March 12 at the Sheraton Hotel with 15 at dinner and 29 members at the business session.

A bumper crop of new members were welcomed into the Branch. They were: J. R. KRISTOFIK, J. R. CRAIN, R. E. HARROVER, JR., W. L. BOHMAN, D. M. RONEY, JR., J. W. CONDON, all of Westinghouse; L. W. MCOMBER, E. I. duPont, and E. SHAY, Wean Engineering. One new application, E. A. DANTINI, Standard Steel Spring, was presented for consideration.

BILL WILSON, Annual Banquet chairman, reported that all plans have been completed for May 2 at the Sheraton Hotel. Joe Schaeffer and his orchestra will entertain and there will be numerous door prizes along with an elaborate program.

The secretary reminded members of the December cover contest for PLATING and also commented on the readership survey.

Main business of the evening was the election of officers for the next fiscal year. New officers are:

President—E. B. WASHBURN
First Vice-President—R. E. VARNER
Second Vice-President—R. H. SCHINDLER
Librarian—M. CERESA
Secretary—W. D. WILSON
Treasurer—C. MCHATTIE
Delegates—R. GOLDBACH, R. A. WOOFTER, E. B. WASHBURN
Alternates—L. LANCY, L. SCHMITT, SR., M. CERESA

After the election an Alcoa film was shown which presented a picture of research and development in a most interesting and entertaining manner.

R. H. SCHINDLER, *Secretary*

PROVIDENCE-ATTLEBORO BRANCH

The April meeting was held at the Providence Engineering Hall on the 20th at 8:30 P. M.

BRANCH PRESIDENT GEORGE GIBBS appointed JOHN HENRY to plan the Spring Frolic which is held in Attleboro every Spring.

JOHN HOSDOWICH, Assistant Secretary of United Chromium, Inc., and Editor of "Unichrome Observer", was introduced as guest speaker for the evening. The subject, "Chromium Plating", was described in great detail, and his talk was augmented by some excellent slides. Hosdowich traced the history of chromium plating down to the present S R H S solution.

Barrel plating of chromium was discussed at great length. Today's barrels will plate about ten pounds of small parts per load and draw about 800 amps. The working principle of the barrel is that it must pause, plate, pause in that order to get a good plate. The high cost of this barrel prohibits its installation in small plants.

A long discussion followed the talk chiefly on barrel chromium plating. The meeting adjourned at 10:15 P. M. with about 35 members and guests present.

HENRY SHAVIER, *Secretary*

ROCHESTER BRANCH

The April meeting was held at the 40 & 8 Club on the 20th. The principal item of business was the election of officers for the coming year. Re-elected President was J. LENZI Others elected were:

First Vice-President—D. BLUM
Second Vice-President—R. BARKER
Secretary—E. WALLIN
Treasurer—H. BAKER
Librarian—F. THIEM
Board of Managers—R. FLINT, J. HULL, J. ADAMS, V. SCHAEFFER, C. THORNTON
Delegates—L. MORRISON, D. BLUM, J. HULL
Alternates—R. MINARD, F. THIEM, D. ANDERSON

President Lenzi welcomed into Branch membership: JOHN HOURIHAN, HAROLD FULTON, DAVID PENN and ARTHUR CHAMBERS

After discussion of the "Schaefer" proposal (concerning Society publications), it was unanimously greed that the Rochester Branch go on record as being in favor of it provided the "no extra cost" stipulation is adhered to.

A review of the minutes of the Columbus Interim meeting was presented by the Branch Secretary and as an outgrowth of the preliminary results of the Readership Survey presented there, it was decided that a similar survey will be made of Rochester members for Branch use in planning programs, etc.

A problem session followed the business meeting during which the members present with the Librarian as moderator, discussed plating problems. Refreshments wound up the evening.

E. WALLIN, *Secretary*

ROCKFORD BRANCH

The Branch held a monthly meeting March 16, at Juls Restaurant at Rock Falls, Ill., with 80 present for the Smorgasbord dinner and lecture.

PRESIDENT DALE CHAPMAN called upon ELSWORTH BUDDEN to report on the program of the annual banquet and upon BILL GEISSMAN to report on the speakers for the educational session at the annual meeting and then on WALKER EATON to report on the Nominating Committee's

selection for officers for the coming year. Nominated and elected were the following:

President—V. WISEN
First Vice-President—W. FOLEY
Second Vice-President—ROBERT JOHNSON
Secretary-Treasurer—ROGER JOHNSON
Librarian—W. GEISSMAN
Board of Managers—D. CHAPMAN, S. GOLDING, L. WEEG

Librarian Bill Geissman introduced the evening's speaker, J. J. GILMORE, President of Micro Switch Company, who delivered an interesting talk that prompted a lively question-and-answer period.

A joint meeting was held with the American Society for Quality Control at the Hotel Faust April 13, 1953 at 7:00 P. M.

President Vern Wisen opened the meeting by welcoming the members of the Quality Control Society to the annual joint meeting.

Past President Dale Chapman presented the Branch with a beautiful brass bell having an emblem A. F. S. on the top and an inscription on the bell "Presented to Rockford Branch American Electroplaters' Society by Turner Brass Works, Sycamore, Illinois, 1953".

This joint meeting is now an annual Branch affair. Last year the Quality Control Society furnished a lecturer who explained to the members the mathematical mechanics of Quality Control. This year's speaker, GENE BOZEL, Sales Engineer, Hanson-Van Winkle & Munning Company, lectured on "Plating and Quality Control" in terms which the members of the Quality Control Society could understand so as to enable them to apply quality control to plating.

ROGER JOHNSON, *Secretary-Treasurer*

ST. JOSEPH VALLEY BRANCH

A regular monthly meeting was held April 1 at the Elkhart Hotel. Thirty-one members and guests attended the Annual Ladies' Night dinner and program.

PRESIDENT RICHARD LOCKERBIE then proceeded to install the new officers as follows:

President—W. S. McDOWELL
First Vice-President—J. BAYMAN
Second Vice-President—R. BROUWER
Secretary-Treasurer—E. ROTH
Librarian—D. POUCHER

John Bayman, Chairman of the Ladies' Night meeting, then introduced W. F. CARR, Lear, Inc., Grand Rapids, who spoke on "Automatic Pilots and Guided Missiles". He gave a short history of Lear, Inc., and explained his mission to acquaint the public with their military products.

He stated that Automatic pilots are a real necessity because of the rapid development of faster and much more complicated aircraft which require controls practically beyond the capabilities of human beings. After the talk on automatic pilots a question-and-answer period followed in which the ladies participated with great interest.

Carr then proceeded to discuss guided missiles, which he said are inanimate objects with a given amount of intelligence built into them by means of instruments and controls. The newest guided missiles are capable of meeting any attacking aircraft at supersonic speeds. Within 120 second after a push button control is released the newest guided missiles can be airborne at supersonic speeds to meet and destroy any target it is set for. Its accuracy is phenomenal in that it can hit any given target within 300 yards anywhere in the world.

The audience was kept spellbound by the talk—the questions by the ladies indicated that they, too, were much interested—and that it was one of the most interesting Ladies' Nights held.

Winners of the drawing for the two door awards for the ladies were MRS.

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DUANE POUCHER and MRS. E. J. WILHELM.

EUGENE ROTH, *Secretary-Treasurer*

SYRACUSE BRANCH

The March meeting was held at Bill Richards Restaurant, Syracuse, N. Y., on the 16th. Fifty-four members and guests attended.

Four new applicants for memberships were proposed and accepted as follows: BENNIE TISI, WILLIAM O. NAYLON, FRANK X. LEONE, and PAUL D. CALLAHAN.

The slate of officers as proposed by the Nominating Committee was unanimously elected as follows:

President—D. GRAY
First Vice-President—V. P. MCCONNELL
Librarian—A. GUTEDUNST
Recording Secretary—D. MORRIS
Board of Managers—K. S. PARNELL

BRANCH LIBRARIAN PIASECKI introduced the speaker of the evening, A. O. SQUITERO, chief chemist, Hanson-Van Winkle-Munning Company. Squitero's topic was "PR-WES-X-Copper" which provided the membership with a very educational session. Many questions were asked and the whole talk was enjoyed by all the members. Many pencils were worn out during this very excellent talk.

Refreshments were provided by the Hanson-Van Winkle-Munning Company with their representative, CHARLIE BRIDGETT, acting as host.

LINDLEY S. WOOD, *Secretary*

WATERBURY BRANCH

At a regular meeting held April 9 at the Hotel Elton, BILL GRAY, one of the charter members, formally installed the new officers of the Branch. FRANCIS T. EDDY, President, opened the meeting, and turned it over to the technical chairman, ELLSWORTH T. CANDEE. A book review was presented by GEORGE DUBPERNELL, after which DR. R. A. SCHAEFER, Vice-President of the Supreme Society, discussed matters of interest regarding the Philadelphia Convention.

Dr. R. A. Schaefer was also guest speaker and in his talk dealt with "Selected Cathode Shapes and Their Effect on Metal Distribution". He briefly described the large number of variables which have an important effect on metal distribution as illustrated by the basic cathode shapes; namely, flats, projecting and recessed cathodes. One can catalog the common plating solutions into four convenient groups according to their relative throwing power. Generally speaking, the poorer the throwing power of the plating bath, the greater the variation in deposited metal thickness on any specific cathode.

A number of slides were shown to illustrate metal distribution variation under different plating conditions. Under most plating conditions the old familiar Watt's nickel bath gives a metal distribution which is practically theoretical—meaning without any polarization. Addition agents and higher current densities usually increase polarization which has the practical effect of increasing plated metal uniformity.

Any cathode shape except a perfect right angle can be plated uniformly at average densities if the rack, insulation and anode design, and their respective positions are properly located with respect to the cathode. Generally speaking, the lower the current density, the more uniform the deposit will be; while agitation does the reverse by destroying polarizing films.

The speaker showed a number of slides which illustrated the unique types of functional plating in the bearing industry, together with rack design and anode positioning to facilitate uniform distribution.

During the business session that followed the talk a proposal was made to have the Waterbury Branch nominate Francis T. Eddy as a candidate for Third Vice-President of the Supreme Society at the Convention in Philadelphia. His ability and his interest in the Society make him an excellent candidate for the job. All agreed to get on the band wagon and to promote his candidacy.

L. J. BAKINOW, *Publicity Chairman*

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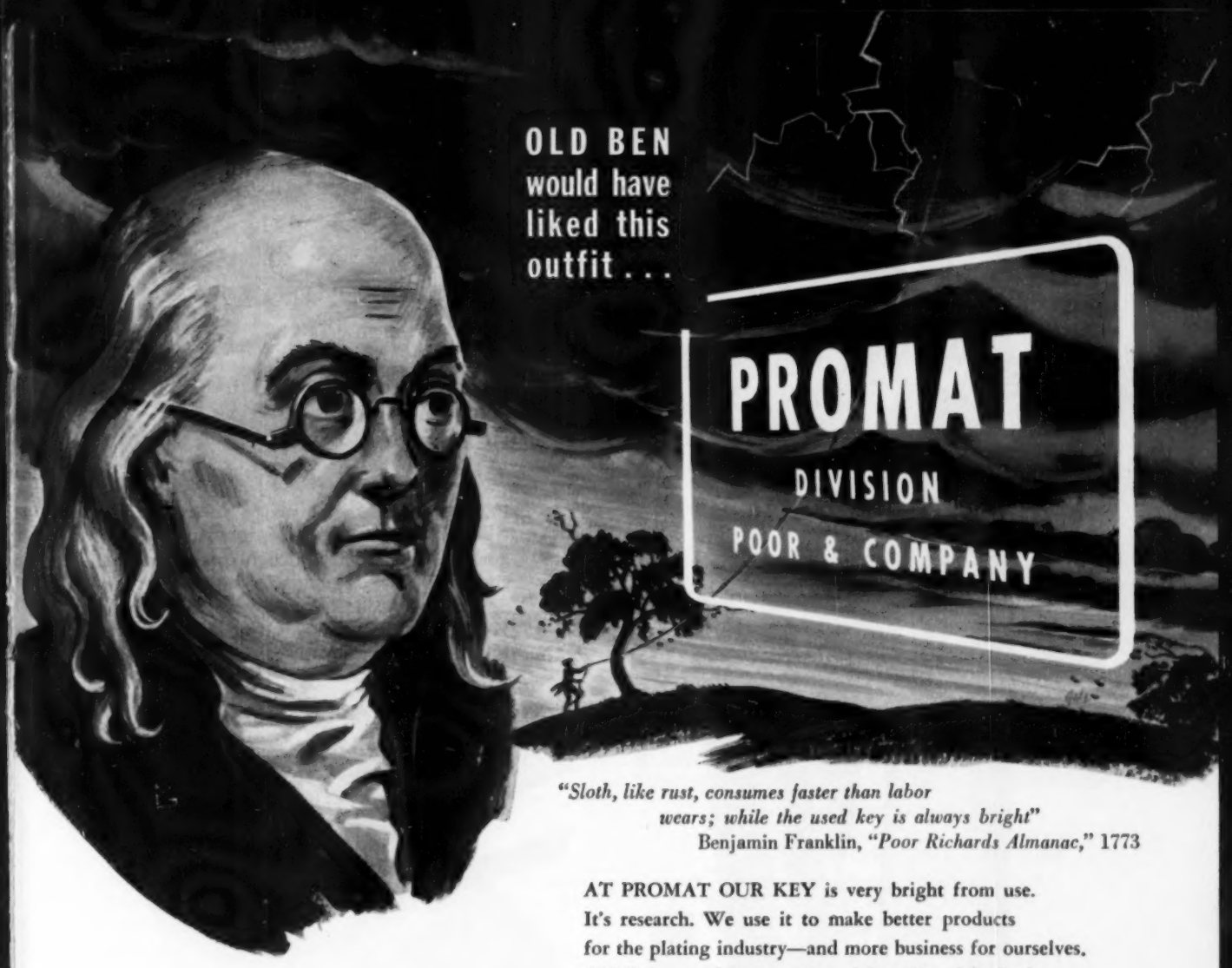

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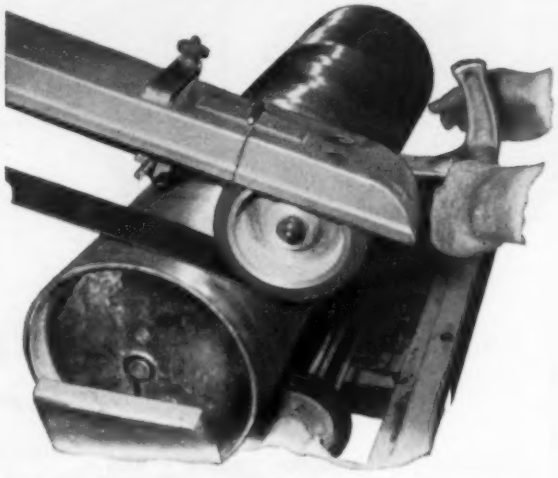

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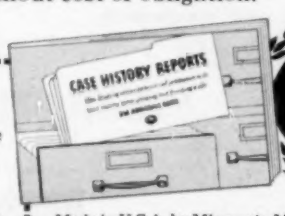

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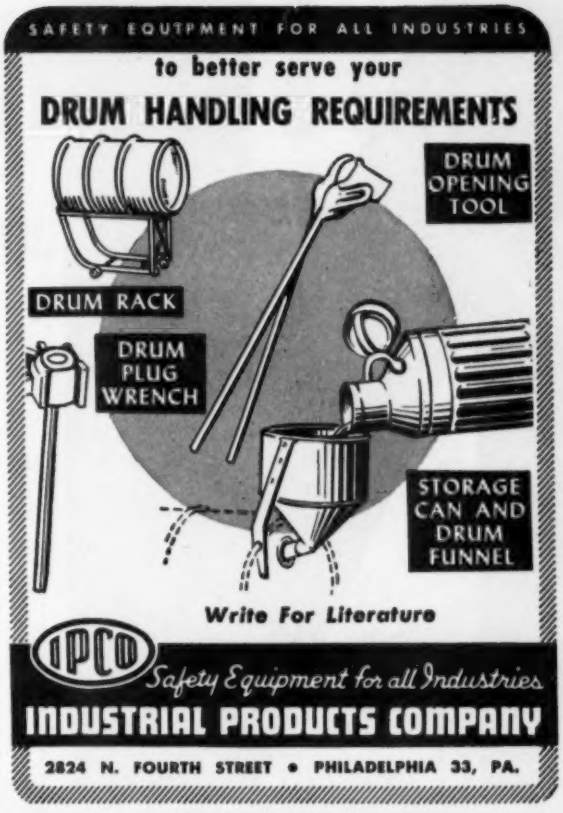

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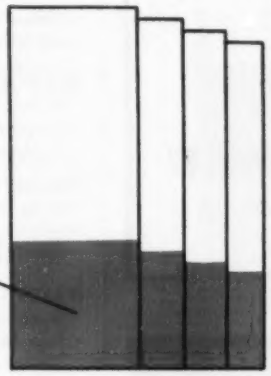

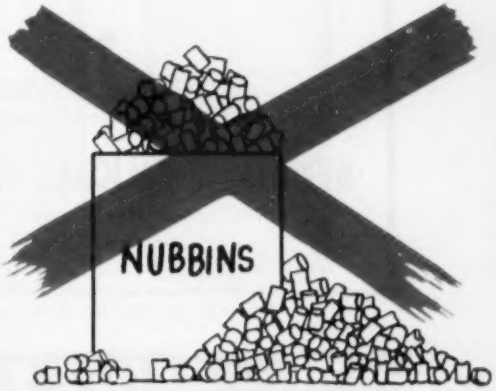

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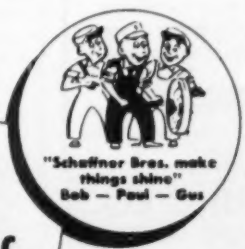

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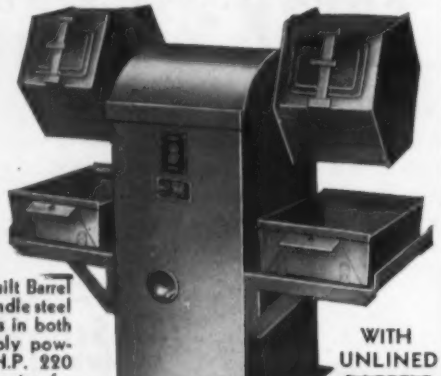

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MILWAUKEE meets first Friday of each month in the East Room, Hotel Ambassador. Secretary-Treasurer, E. E. Piellusch, 2921 S. 90th Street, West Allis 14, Wis. Research Finance Committee Chairman, T. D. Hartshorn, 4818 N. Woodruff Avenue, Milwaukee 11, Wis.

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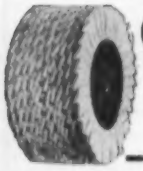

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WATERBURY meets second Thursday of each month in Elton Hotel. Dinner, 6:30 P. M.; meeting, 8 P. M. Secretary-Treasurer, Spencer L. Henn, P. O. Box, Drawer B, Chesbire, Conn.

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